Rock Products

THE INDUSTRY'S RECOGNIZED AUTHORITY

DECEMBER, 1938


LITTLE CREEK SAND & GRAVEL CORPORATION
115 BANK STREET
NORFOLK, VIRGINIA

O. B. PRESTON, SALES AGENT
PHONE: NORFOLK 20066

The Allen-Sherman-Hoff Company
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Gentlemen;

Referring to the 6" Hydroseal Pump I recently purchased from you and answering the questions raised in yours of the 4th.

This pump is operating through approximately 300' of 6" line. The material is being raised 40 to 45'. It is powered by a 100 H.P. "International" gas engine and we are using almost the maximum horsepower of the engine.

With this set-up we find that the suction line shows 20 to 25" of vacuum and we are able to load around 70 tons of sand in 45 minutes.

Trusting this is the information you desire and with best wishes, I am,

Yours very truly,

LITTLE CREEK SAND & GRAVEL CORP.
(A. LeB. Ribble, Pres.)
A. LeB. Ribble

In January **of this year, the Little Creek Sand and Gravel Co., Norfolk, Va. installed a Hydroseal Dredge Pump. The capacity of this pump so far exceeded what they expected of a 6" pump that Mr. A. LeB. Ribble, owner, wrote us the above letter. Higher capacity with the same size pipe line means they can load a car in less pumping time. This means a direct saving in power. If you would be interested in pumping more sand in the same number of hours you are now running, or in maintaining your present output in less pumping time, address the nearest office listed below for a copy of our 36-page Catalog No. 937, describing Hydroseal Sand, Slurry and Dredge Pumps.**

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Rock Products

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CEMENT and **ENGINEERING NEWS** Founded 1896

CONCRETE PRODUCTS Est. 1918

Recognized the World Over as the Leader in Its Field

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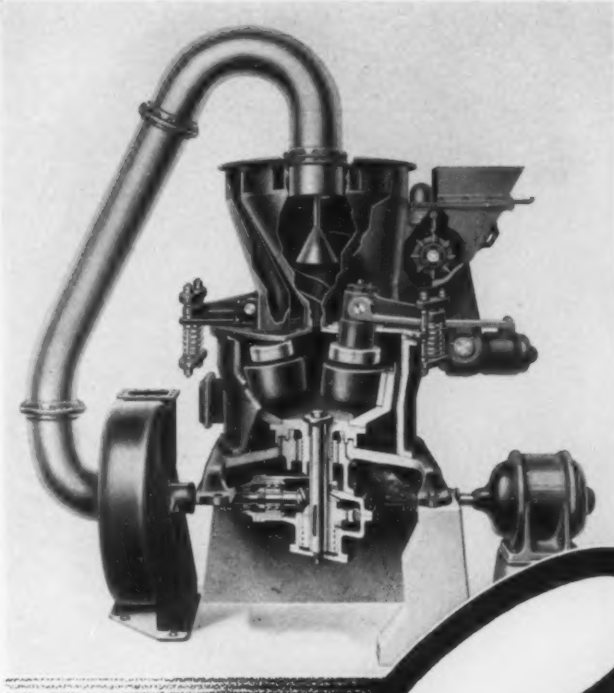

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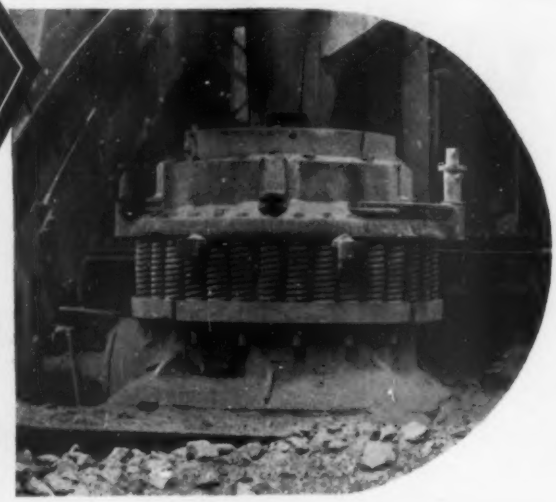
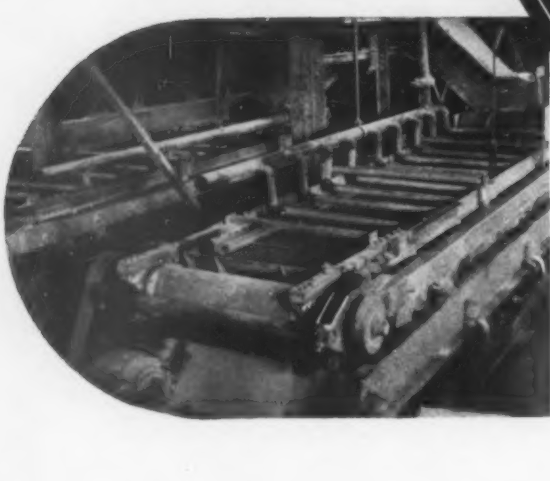


AND

SCREENING



In addition to the Symons Standard Cone, the Short Head type is available where a greater quantity of finer product is desired. This crusher meets today's demands for finer crushed materials.

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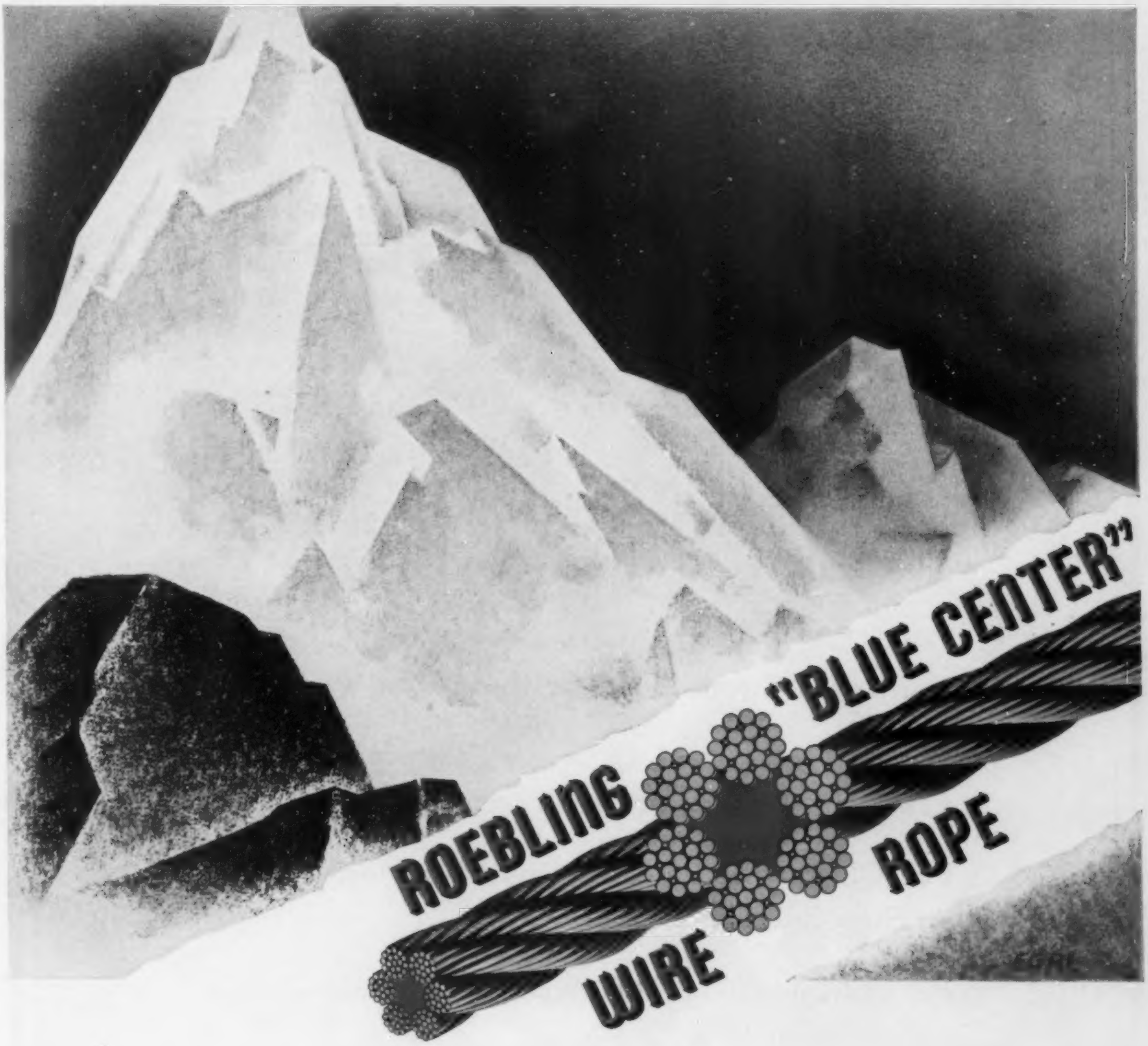

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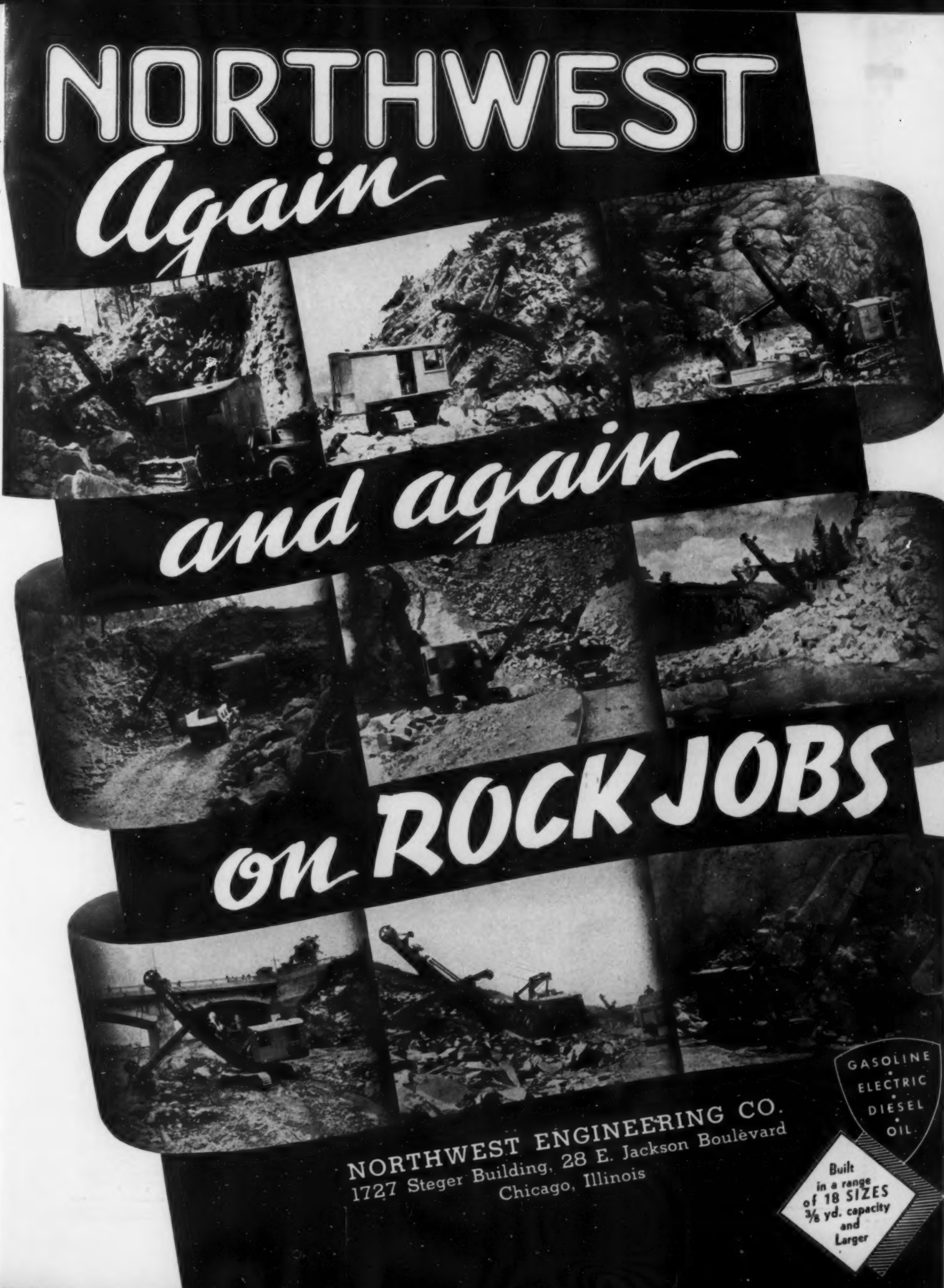
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Announcement

Twenty-Second Annual Convention
NATIONAL CRUSHED STONE ASSOCIATION

In conjunction with which will be held

THE MANUFACTURERS' DIVISION EXPOSITION OF MACHINERY, EQUIPMENT, AND SUPPLIES

NETHERLAND PLAZA HOTEL
CINCINNATI, OHIO

JANUARY 30, 31 AND FEBRUARY 1, 1939

The Annual Convention of the National Crushed Stone Association, during the years since its inception, has become recognized as an event of outstanding significance to crushed stone producers individually and to the industry as a whole.

It serves, as no other medium can, to develop, crystalize, and express industry opinion. It signifies solidarity of purpose and the ablity of those engaged in the same line of activity to unite in the solution of common problems.

As individuals, producers will find much to reward them for a visit to Cincinnati. Speakers of outstanding reputation and experience will discuss problems of timely interest, both technical and legislative; opportunity will be afforded for the mutually beneficial exchange of opinions with fellow-producers, to say nothing of the pleasure to be derived from renewing old acquaintanceships; the Manufacturers' Division Exposition will command studious attention for the helpful suggestions to be obtained from an inspection of the latest developments and improvements in machinery and equipment used in the crushed stone industry.

All crushed stone producers of the United States and Canada, whether or not members of the National Crushed Stone Association, are cordially invited to attend our Twenty-second Annual Convention. Make your plans now to be present at Cincinnati on January 30, 31 and February 1, 1939.

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19 SCREENS in one plant

AND EVERY ONE CUTTING PRODUCTION COSTS!

No one screen can handle all sizing jobs. You can't keep costs down, unless each screen pays its way — doing the work for which it was built.

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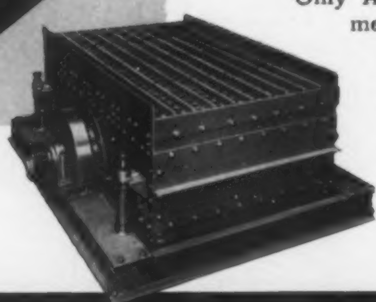

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CRUSHING · CEMENT · AND MINING DIVISION

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ROCK PRODUCTS

Collective Labor Contracts

One of the objects of the Federal wage and hour law is to eliminate inequalities in competitive conditions based on differences in wage scales—to eliminate sweat-shop conditions is the way it is usually phrased. In other words, an employer is no longer to be allowed to obtain a competitive advantage by "sweating" or paying his workers less than a legal minimum. This was one of the primary objectives of the old N.R.A., and one that received wholehearted support from a large part of industry. The chief opposition came from small operators in country places, who resisted being compelled to pay city wage scales.

The present Federal wage and hour law will not help the situation much in the sand, gravel and crushed stone industries because producers who avoid shipments across state lines are not affected. Probably not more than one-third of the country's production now moves in interstate commerce, and by mutual avoidance of interstate shipments competitors may escape the law without in many cases losing a great deal of their normal volume of business. In a state like California practically none of the production has ever moved in interstate commerce.

It is interesting therefore to learn that producers in California have solved this particular problem independently of Federal legislation, or state legislation, apparently satisfactorily, by means of a collective labor contract. The essential features of this contract, made by the Rock, Sand and Gravel Producers' Association of Northern California with seven American Federation of Labor unions, are to be found elsewhere in this issue. It has now been in effect for about a year and a half.

Perhaps the most important feature of this method of handling wages is that it takes care of variations entirely justified by differences in costs of living between city and country. These differences, of course, are just as evident to labor as they are to employers. Such differences above the minimum are not prohibited by the Federal wage and hour law, but under the law, as the wage rate increases year by year, the tendency will be more and more to "freeze" it at certain levels irrespective of locality. The passage of the act was advocated by many industrialists and localities because it would have this tendency and thus equalize competitive conditions, now quite divergent because of differences in living conditions, or standards of living in various parts of the country.

Hardly less important is the directness and simplicity of the wording of the contract, for any one who can read the English language certainly can readily understand it; and it leaves scant room for misunderstanding. Obviously, that is a great virtue in a legal document of this kind.

As to matters of policy in signing a group, or collective, contract of this character much might be said on both sides. Many employers would criticize it because it provides for a closed shop; but that is an issue much larger than this particular contract. It might be more logically criticized because it tends to remove employes one or two degrees from their employers—their grievances may now be settled by third parties without the knowledge necessarily of the employer actually involved. This may be a good argument in its favor; certainly so if the employer is a type not well fitted temperamentally or otherwise to handle union labor problems, and the officers of the association are better fitted.

There are advantages to labor; more perhaps than to its employer. One or two lone members of a union in a single plant would not be objects of much concern to union officials; grouped they comprise a respectable unit. Through their union affiliations and the intimacy of their union officials with the association's officers, it is safe to assume that they can find employment more readily in the plants of competitive companies than would otherwise be the case. For example, one plant may be abnormally busy, while another is slack; it should be very simple under these conditions for the busy plant to obtain the services of an experienced man, or men, temporarily. The whole setup would tend to stabilize employment in the industry.

From the employers' point of view labor union officials have gained an insight into some of the peculiar conditions in this industry and have learned not to be so hard-boiled as they have been on some construction jobs. So far at least they have not proved to be such unreasoning characters as building trades labor bosses are frequently painted. Perhaps they are learning something too in dealing with a permanent industry rather than lone-wolf contractors.

Whatever the reader's opinion may be of the wisdom of this kind of a labor contract we have got to take off our hats to our California friends for going out to meet the issue instead of waiting unprepared for it to descend on them. It is one dividend that N.R.A. paid these producers, for prior to N.R.A. one could not have induced all of this present group to assemble in one room.

Nathan C. Rockwood

Easy to Meet Mississippi Aggregate Specifications

Production methods have been greatly simplified by Mississippi's alternate specifications for coarse aggregates to be used in carrying out the large program of highway construction now under way. In the northern part of the state a number of plants are meeting the so-called G-5 specification which requires no crushed gravel. This simplifies production as there is little gravel of sufficient size in this part of the state to warrant crushing.

In general, the method of operation is to pump to a spread table and then pass the material over tilted stationary screens. The production of concrete sand is not difficult, the majority of the plants separating out the sand from the screen throughs by passage over launder classifiers to which pockets have been added.

One of the modern plants, a new steel structure built by the Columbus Gravel Co., has several interesting features, notably in the classification of concrete sand and in the flexibility of its control. The deposit under excavation contains about 50 percent gravel, all under 2 in. in size, covered with from 18- to 20-in. of overburden. The light, silty overburden is not stripped off and must be washed out through the plant. About one foot of this material is run through the plant to every 12 or 14 ft. of sand and gravel. The sizing screens are of the tilted, stationary type and excavation is done by means of a dredge pump.

Sand Specifications For Various Classifications

Two sand classifications (highway specification concrete sand and mortar or locomotive sand) are produced with the throughs from the sand screen which has ¼-in. sq. openings.

Concrete sand, made to specification, requires that 0 to 5 percent be retained on a No. 4-mesh sieve; that all sand pass a ⅜-in. screen; and that less than 20 percent be retained on a No. 8 screen. From 10 to 50 percent must be retained on a No. 16 sieve, 70 to 97 percent on a No. 50 and 95 to 100 percent on a No. 100, according to this specification.

From the dredge pump, a 10-in. pipeline carries 15 to 20 percent solids over the screens where the water and minus ¼-in. solids from the sand screen fall into a steel sand box below, which has a capacity of one car or 60 tons. The sharp, sand particles coming through the screen openings above settle first as the sand tank fills up. One side of the settling box is lower than the other so that when the box fills up, excess water and materials will go over the overflow lip to a launder back into the lake.

The sand box, which has a flat bottom, is filled to the overflow lip level when the plant is in operation and contains about 75 percent solids. About 90 to 95 percent of the light, silty material is floated out over this overflow lip and wasted.

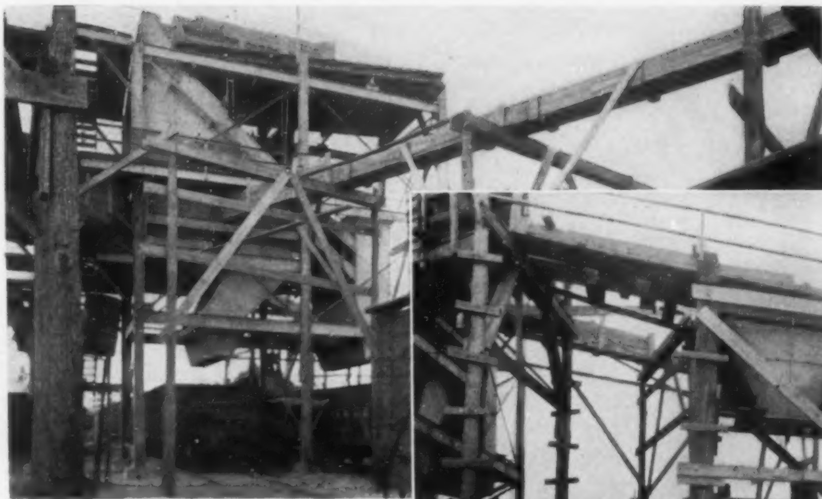
On the side of the box opposite the overflow lip, sand is drawn for further washing and classification. Near the bottom of the tank, just above another launder, sand can be drawn from any one or all four 3-in. pipe openings into the launder. The sand, of course, is very fluid and readily flows through the pipes.

Sand Classification

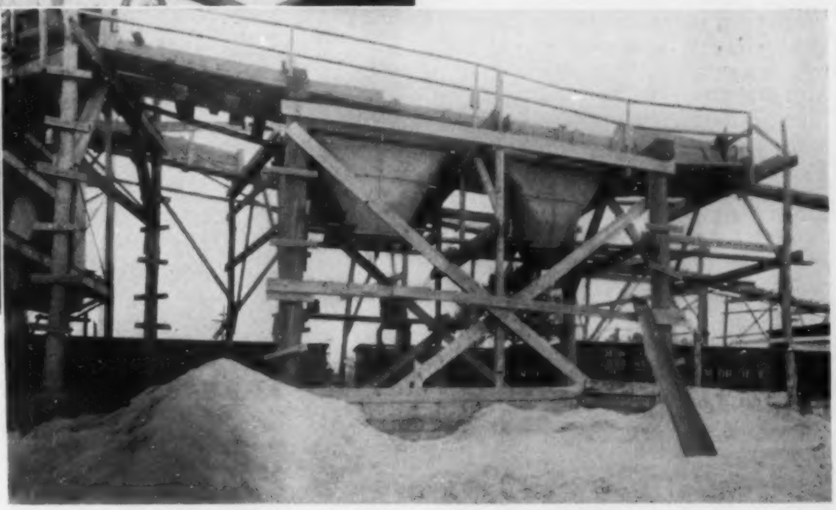
Sand is discharged through the pipe by opening manually-operated hinged gates which, in the closed position, cover the pipe outlets. These gates may be opened in full or in part to control the volume of sand flowing into the launder.

The launder, or flume, which is 18 in. wide and 2 ft. deep and has a slope

Concrete sand settles in the first hopper and mason's sand through the screen into the hopper in background. Note rods for releasing material below into cars



Above: Another view of gravel plant, showing stationary screens above and large hopper chutes for quick car-loading. The chutes are lined with old tire casings



Below: Home-made hoppers for concrete sand and mortar sand. Silt and excess fines go through the pipe on right to waste

of 8 in. to 16 ft. of length, serves both as a re-washer and sand classifier. Water is introduced at the high end of the launder by a 6-in. Worthington pump driven by a 60-hp. motor.

In its flow downgrade, the sand and water first pass over a concrete sand hopper with an open top and then flow to a mortar or locomotive sand hopper covered by Tyrod screen cloth with .093-in. openings. A positive control of sand classification is exercised by regulating the volume of water entering the flume. To give a variation in water volume from 300 to 1500 g.p.m. and a corresponding change in the water velocity through the launder and over the sand collecting hoppers, a hand valve is provided on the standpipe leading from the 6-in. pump at the head of the flume.

To keep the fines and silt in suspension, the launder has two 45 deg. bends in opposite directions between the sand box and the sand hoppers to give the necessary turbulence. Sand classification operation is comparatively simple. If too much No. 4 material settles in the concrete sand hopper, the hand valve on the water line is partially closed to reduce the water velocity. This will allow more fines to settle in the concrete sand hopper. Similarly, increasing the water flow will give a coarser concrete sand. After passing the concrete sand hopper, the flume widens out over the mortar sand hopper to reduce the water velocity and mortar sand settles through the screen cloth.

The company maintains its own testing laboratory and runs frequent sieve tests and color analyses to check on the efficiency of sizing and washing. Settling tanks are somewhat unusual in that they were built from smoke stack flue heads. Each tank has a capacity of 3 cu. yd. of sand. The draw-off is accomplished by raising or lowering a vertical rod connected to a plunger fitting in a 3-in. pipe outlet below each hopper. Overflow from the mortar sand hopper and the silt contained in suspension is wasted back into a lake. When gravel only is being produced, the pipe discharges from the 60-ton sand tank are closed and excess sand and water passes over the overflow lip into the launder and is wasted.

Stationary screens are raised or lowered by turnbuckles above to vary sizing. The levers are used to deflect material to cars on either railway track

There are several interesting features in this stationary screening plant. Electric power rates had been reduced at the time this plant was built (April, 1937) to the point where electric power was more economical for operation than Diesel engine power. Accordingly, the company scrapped its Diesel-operated pump dredge and pressed into service its 26- x 50-ft. steel pontoon dredge, which is electrified throughout.

Capacity was raised to 250 tons per hour (an increase of from 15 to 20 percent) with the installation of a 10-in. Amsco counterflow pump to replace a standard 10-in. pump. The new pump is equipped with a 2-way Amsco thrust bearing which is adjustable to allow setting of the impeller up to 0.002 in. of the pump shell. It is driven by a 250-hp. G. E. motor at 585 r.p.m., and has a suction line of 12 in. to reduce friction losses.

Gravel Sizing

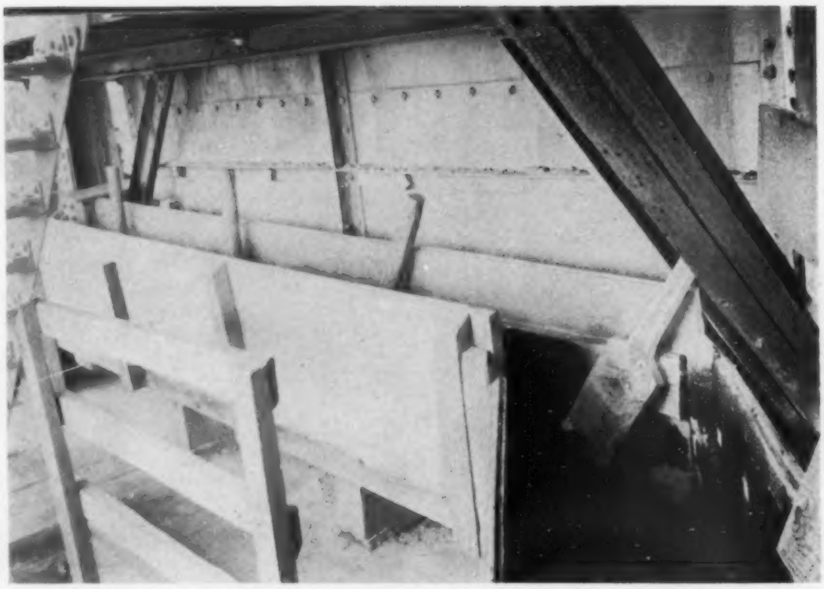
As the deposit contains less than 1/10 of 1 percent plus 2-in. material, no provision is made for crushing and concrete coarse aggregate is produced to meet the highway G-5 specification which applies for concrete highway, bridge and culvert construction.

The G-5 highway specification requires that there be no gravel retained on the 1½-in. screen, that less than 10 percent be retained on the 1-in., that 45 to 70 percent be retained on the ½-in., 92 to 100 percent on the No. 4

sieve, and 99 percent on the No. 16 mesh.

Coming from the pump, the 10-in. pipeline discharges to a spreading table, 25 ft. in length, which widens out to the screen width, for equal distribution over the screen and to slow the velocity. Some scrubbing takes place on the spread table as the material rolls over its metal plate bottom.

Screening is accomplished with two stationary screens, the upper being a split screen with a shelf deck, and the lower, a sand screen with ¼-in. openings. The top screen is 13 ft. 8 in. wide, and 12 ft. 7 in. long in the sloping direction, including the shelf deck. The sand screen is of the same width, and is 9 ft. in length. The shelf deck in the top screen, which is 5 ft. 2 in. in length and also has the same width, takes the flow of material direct from the spread table and of course is subject to greater abrasion and wear. By having it separated from the rest of the upper screen and only 5 ft. 2 in. in length, replacement costs are considerably reduced.



Sand is released from the sand tank into the flume for classification and rewashing through four 3-in. pipe openings. Note the bend into flume to create turbulence and keep fines in suspension. Water is introduced into the flume on the left

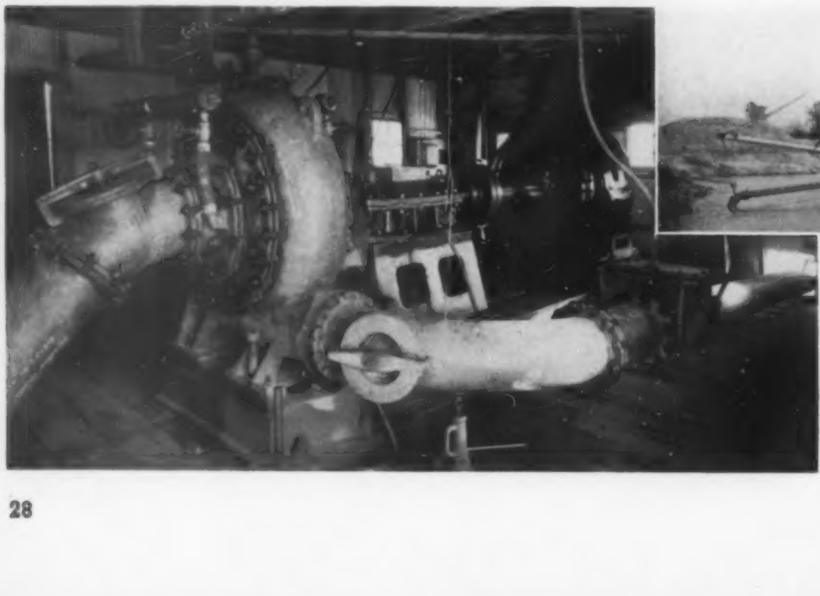
When producing G-5 specification gravel, this screen has 7/16 in. sq. openings to take out some of the smaller sizes. The throughs go direct to the sand screen below and the oversize passes over the remainder of the top screen cloth. In coming from the shelf screen the oversize first hits a baffle to slow down the velocity and increase the screening efficiency over the remainder of the top screen. Slopes of the screens are readily varied by taking up on turnbuckles. This is occasionally done to decrease the slopes if more fine sizes are desirable. Openings on the top deck are 7/16-in. square mesh. Slopes of the screens are varied from about 7-in. in 12 to 10-in. in 12. The ¼-in. to 7/16-in. material is taken out as pea gravel.

There is no bin storage, the plant having been built with hoppers for direct loading to cars. Manually-operated levers can be operated to divert either size material to a car directly below the screens or to one on a track on the side of the plant, or any combination desired. Trackage has been provided to handle from 80 to 90 standard railroad cars at one time and as many as 62 have been shipped in one day.

Aggregates are placed in outside stockpiles from cars and rehandled to cars by a Northwest gasoline-driven dragline equipped with either a 1-cu. yd. Page dragline bucket or a Hayward 1-cu. yd. clamshell. The company has purchased 575 acres of land which contains gravel to depths of as much as 25 ft. C. F. Harris, general manager, designed and built the plant.

TRADE STANDARDS adopted by the Compressed Air Institute have just come out in their fifth edition. As in the past editions, there is a concise summary of nomenclature and terminology relating to air and gas compressors as well as data, tables and formulae for the installation and use of compressors. All of these sections have been revised in the light of recent developments, and sections covering apparatus of various types operated by compressed air have been added to the new edition. Copies can be obtained for one dollar from the Compressed Air Insitute, 90 West st., New York, N. Y.

OHIO MARBLE Co., Piqua, Ohio is planning to rebuild its plant completely, except the quarry primary crusher and conveyor. Improvements will include new screens, steel bins, secondary and reduction crushers.



Above: Steel pontoon dredge-boat of Columbus Gravel Co., Columbus, Miss.

Left: "Counterflow" pump has a 12-in. suction and is driven by a 250-hp. electric motor. Note the adjustable thrust bearing in center

Step Up Kiln Efficiency

Reduce Fuel Costs With Direct-Firing Coal Mill Installation

By BROR NORDBERG

In a progressive program to improve the quality of the manufactured product and to increase overall plant efficiency, the Kosmos Portland Cement Co. has completed, at Kosmosdale, Ky., a series of interesting mill improvements.

Modernization work finished early this year in some respects follows closely definite trends taking place in the portland cement industry and in others new principles are involved. The selection of types of machinery and equipment is new for some purposes, but the installation was made only after careful consideration. It is of particular interest to observe the performance of the machinery not tried before in the cement industry.

In order to associate the new improvements with general mill performance some reference will be made to the plant as it was, from the standpoint of obtaining certain desired objectives. The Kosmos plant is a dry process, waste-heat plant with a rated annual output of 1,400,000 bbl. of portland cement. Other products are "Kosmortar", a masonry cement; and Kosmos high early strength portland cement.

Recuperators Replace Old Clinker Coolers

Two 8½- x 125-ft. kilns and four 7- x 6- x 100-ft. kilns are operated. Prior to 1936 each of the kilns had an individual short stack and the clinker was discharged through four 5- x 40-ft. and one 6- x 80-ft. rotary coolers.

A. C. Brown, works manager, is an advocate of hard burning of clinker, precise blending of raw materials and very fine grinding of cement clinker as a solution for many of the faults found in portland cement, particularly with reference to excessive expansion as tested in the autoclave, whether due to free lime, magnesia, or both. Recent improvements in the plant are all designed to promote higher standards of quality in the product. Among the more important developments are improvements in the firing of the kilns and in the control of burning conditions. The clinker coolers as originally installed have been removed, a clinker reclaiming tunnel has been built beneath the firing floor, direct-firing coal mills have been installed, and the kilns are now all equipped with Vanderwerp heat recuperators.

Four years ago the first of the recuperators, 8 ft. in length, was installed on the larger kilns in the interest of fuel economy and the quality of the clinker. In 1937, 4-ft. Vanderwerp recuperators were installed on the shorter kilns, and the first of the direct firing coal mills was installed. Early this year additional coal mills were placed in operation for firing all kilns, the stone and clay dryers and the auxiliary boiler. Eleven unit mills are now in operation.

These mills, designated Unipulvo by the manufacturer, the Strong - Scott Manufacturing Co., Minneapolis, Minn., are the first mills of this type used in firing a rotary cement kiln, although they are extensively used in the direct-firing of steam boilers. Before their selection, Mr. Brown, accompanied by Chief Engineer Kraft, had travelled considerably to observe them in operation in various industrial plants and to study firing practices in a number of cement plants throughout the country.

Direct-Firing Coal Mills Operate On Air Attrition Principle

Operating on the air attrition principle, the mills grind the coal particles while they are suspended in hot air taken from the kilns, the mixture of pulverized coal and primary air entering the kiln through a burner pipe in the same manner as in plants where other types of direct-firing mills are used. The volume of air passed through the mills is unusually large, representing in this installation about 40 percent of the combustion air and making it feasible to introduce primary air and coal into the kilns at temperatures of 250 to 300 deg. F. without danger of premature ignition.

Equipment comprising the mills includes: a fan, a rotor with hammers which operate more on the order of sweeps than as pulverizing media, a coal feeding hopper with an adjustable feeder that operates similarly in principle to an under-fed stoker, and a separating spinner. Capacity is proportionate to the volume of air put through the mills. Fineness is regulated by raising or lowering the spinner in the separator. Each mill is driven by a single motor which is coupled to the rotor and

In the foreground, two B-18 pulverizers firing No. 3 and No. 4 kilns, and beyond, two C-40's firing the large kilns No. 5 and No. 6

View of Kosmos Portland Cement Co. plant at Kosmosdale, Ky., with 300 ft. stack on right

the fan, and there are only two bearings.

Three sizes of mills have been placed in operation, the C40 on the larger kilns (2), the B18 on the shorter kilns and auxiliary boiler (6) and the B8 on the stone and clay dryers (3). The numerals designating the type of unit, C40 for example, represent rated output expressed in hundreds of pounds of pulverized coal per hour.

With the installation of these new units, which is similar in arrangement to that for other types of direct-firing coal units, a less efficient system of bins, conveyors, dryers and grinding mills has been entirely eliminated. With the introduction of direct-firing, it was necessary to change the method of handling coal from storage, and a pulverizer was installed to prepare mine run coal for the mills.

Coal from different sources and of various grades and analyses is stored in the open and is re-handled to a hopper over a reclaiming conveyor tunnel which serves the coal pulverizer. Coal is reclaimed over a 24-in. belt conveyor, 100-ft. centers, into a Williams No. 2BC coal crusher, with an Electric Controller Co. magnet provided over the belt to catch tramp iron.

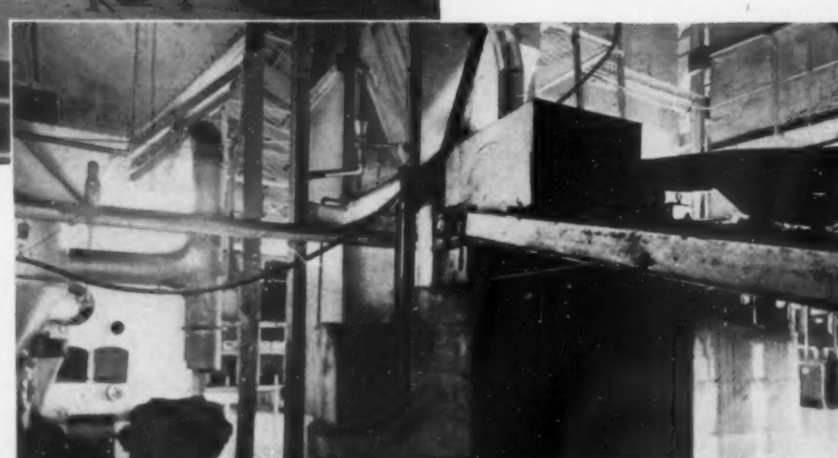
This crusher reduces the coal from a top size of about 2 in. to ½ in. minus, the product being elevated by a double-chain bucket elevator, 47 ft. centers, to a screw conveyor which fills the six coal mill feed bins over the kilns. Cross screw conveyors are provided to fill the bins over the driers.

To keep the kiln firing floor free from coal dust, an American Air Filter Co. No. 10 "Rotoclone" is operated to collect dust from the coal pulverizer and the bucket elevator. Air heated to about 250 deg. F. is drawn through the boot of the elevator from the clinker pan conveyor beneath the kiln floor. This arrangement serves to dry the coal partially and keep it from sticking on the elevator buckets and in the screw conveyors. The dust collecting unit, which is of the wet type, is 99.5 percent efficient in removing all dust from the atmosphere. Precipitated dust is put through the pulverizer with the fresh feed.

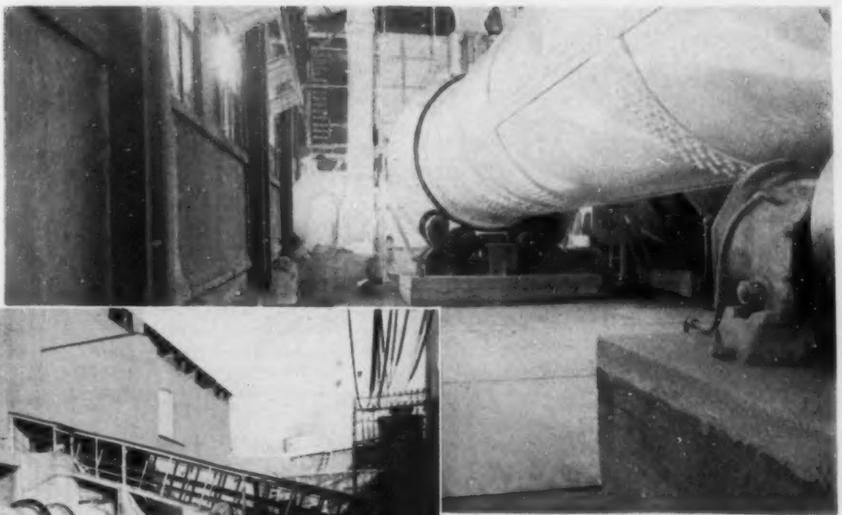
Operating Details of Coal Pulverizers

The C40 and B18 Unipulvo coal mills are on the firing floor directly opposite the kiln hoods. Coal from the overhead bins is fed by gravity into the mill feed hoppers. Primary air is taken from the top of the kiln hood, in each case. A trap is provided in the piping

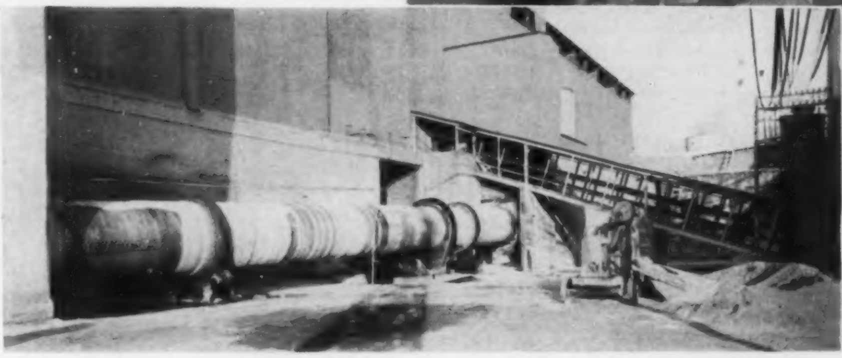
Left: Dust collecting unit which also serves as a source for induced draft through one of the rotary stone dryers



Right: Above is wet dust collector for collecting coal dust generated from the belt discharge into the hammer mill and in bucket elevator. Note return pipe for precipitated dust



Right: Looking toward firing end of kiln, showing fan on left for introducing air through recuperator plates



Left: Arrangement of rotary clinker cooler receiving clinker that has come from kilns over the inclined pan conveyor on right and then passed over a single deck vibrating screen

just before the air enters the coal mill to catch any fine particles of clinker.

Primary air is taken into the mills at 600 to 800 deg. F. and the range of temperatures of the coal and air mixture entering the kilns through the water-cooled burners is 200 to 300 deg. F., depending upon the moisture in the coal. Air temperatures at entrance to and discharge from the mills are recorded by a Brown recording thermometer. Coal is being ground so that 100 percent will pass the 50-mesh sieve, with about 90 percent through the 100-mesh. In this connection it is of interest to know that tests made at the plant have indicated that performance of the mills is only slightly affected by the moisture contained in the coal.

The C40 mills are driven by 75-hp. motors, the B18 mills have 30-hp. motors, and 15-hp. motors drive the mills which fire stone and clay driers.

Method of Kiln Operation

In discussing results obtained, from the standpoint of kiln performance and economy, the method of kiln operation must be considered. While the kilns are driven by variable speed motors, their speeds are not varied. The feed into the kilns is likewise kept constant, the only variable being the rate of coal feed into the kilns.

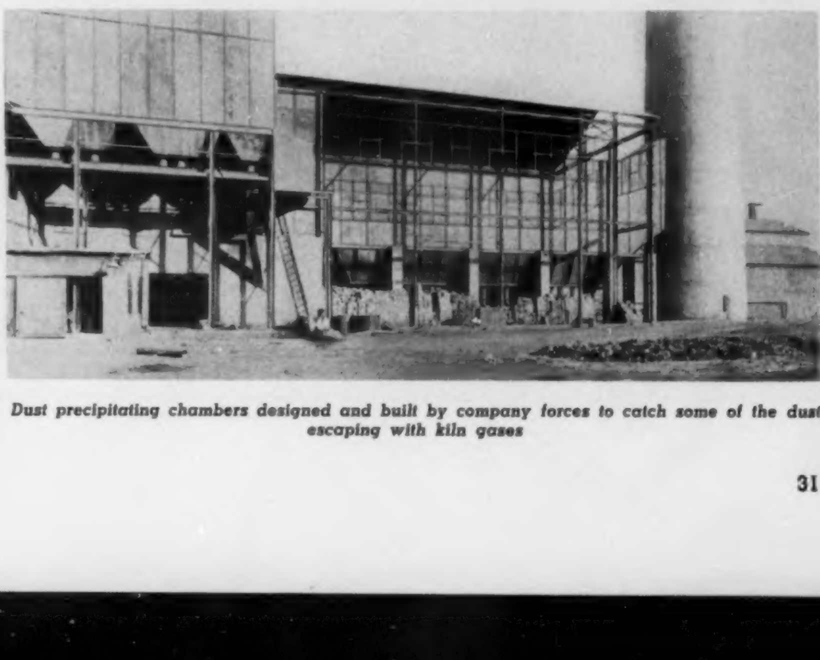
This system of kiln operation has been adopted as a simple and accurate method to regulate and control the burning of clinker. All clinker is burned hard, with a hot-zone temperature of about 2700 deg. which naturally requires a higher rate of fuel consumption, but this sacrifice is made in the interests of a higher grade clinker.

To cut down dust losses, kilns are operated on a draft of 0.1 to 0.2 in. and with about 5 percent excess air. Recuperators on the longer kilns have been shortened from 8 to 6 ft. in order to utilize more effectively the entire kiln lengths and to bring the clinkerizing zone closer to the discharge end of the kiln. Additional cooling after the clinker has passed the first few plates is unimportant, since provision has been made for secondary cooling. The coal mills have been instrumental in obtaining a uniform, hotter flame which is very easily maintained at a constant temperature. They also have been effective in bringing the flame to a high temperature very quickly with the result that burning is accomplished to within 2 ft. of the first recuperator plates. This has of course meant more of a definite chilling from the air introduced through the recuperator plates, which is highly desirable from the standpoint of producing more "glass," with an increased grindability and possibly rendering some of the free magnesia inert.

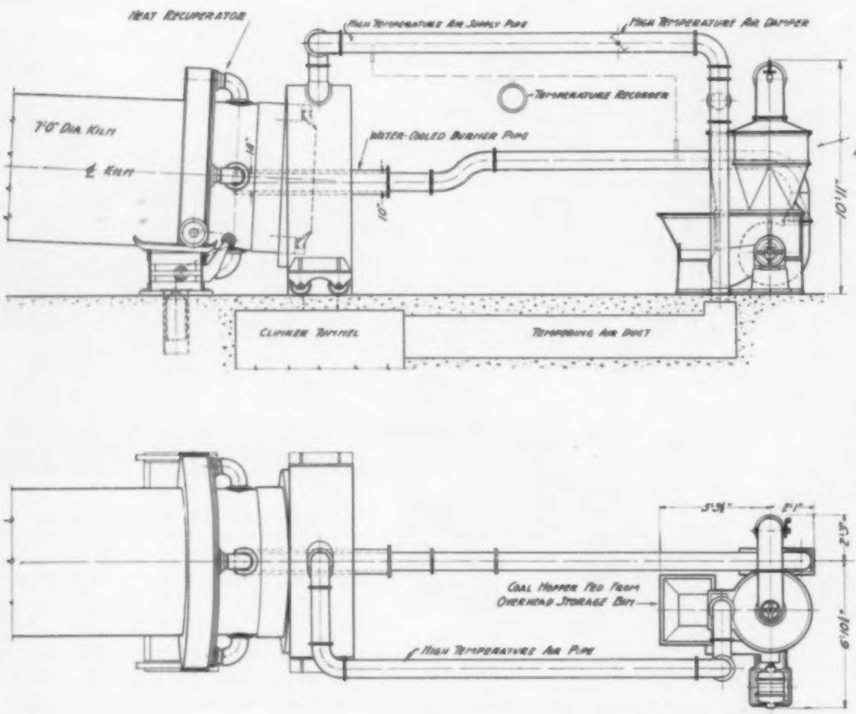
With 40 percent of the combustion air entering the kilns as primary air with the pulverized coal, the secondary air all enters through the recuperator plates.

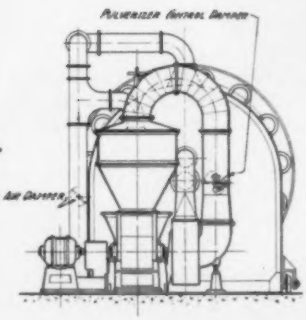
Auxiliary Boilers and Driers Direct-Fired

Since the unit mills were installed, an average fuel ratio of 90 lb. to a barrel is being maintained in the production of harder burned clinker. A substantial saving in coal has been obtained since unit mills were installed.



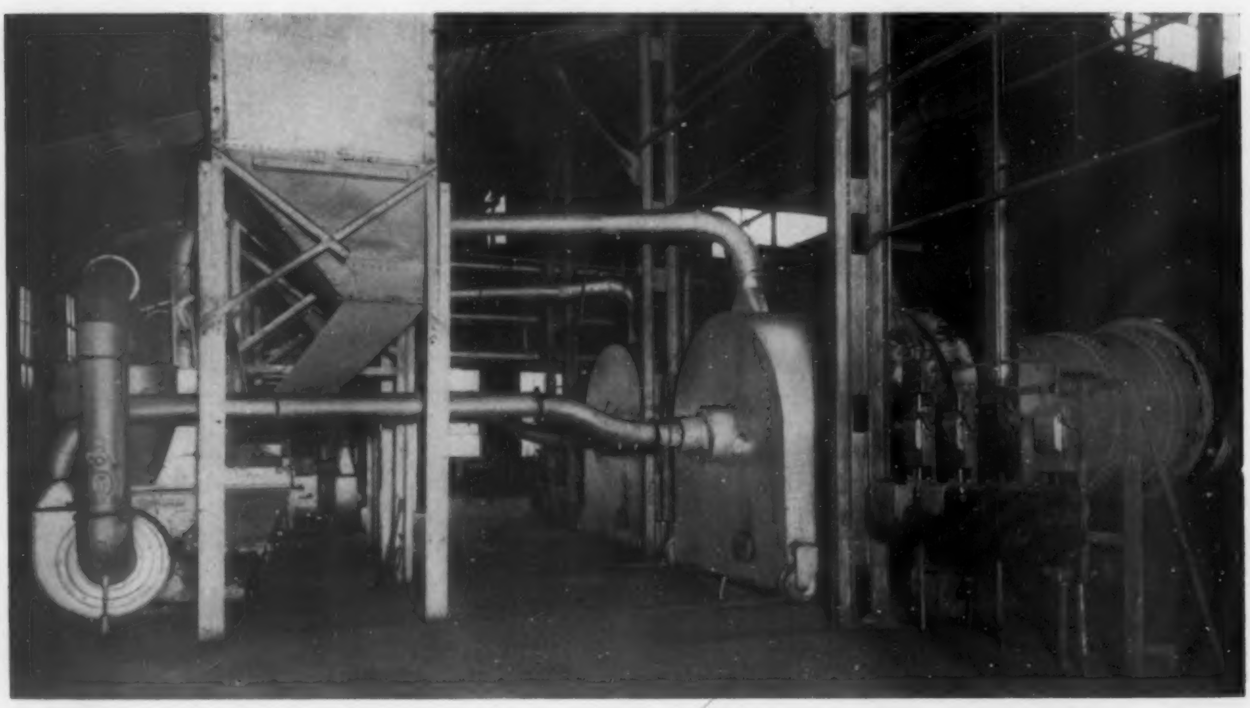
Dust precipitating chambers designed and built by company forces to catch some of the dust escaping with kiln gases





Front end details of direct firing coal pulverizer installation

Plan and elevation drawings of pulverizers direct firing cement kiln at Kosmos Portland Cement Co. plant



Looking toward 7- x 100-ft. kilns No. 2 and No. 1 with waste-heat boiler in background. Note simplicity and shipshape arrangement of pulverizers and spouts

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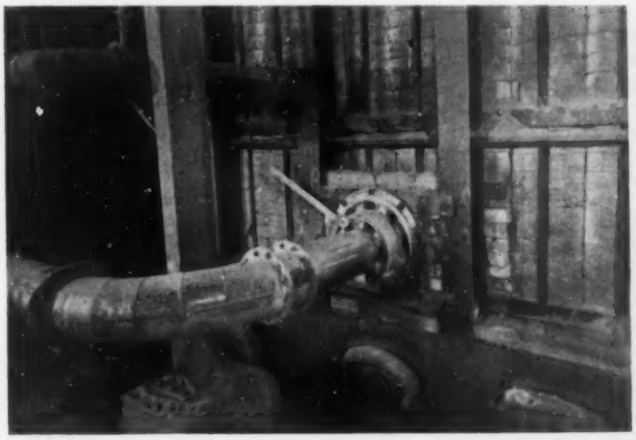


Left: Burner pipe through which primary air and pulverized coal is introduced into stone dryer. Right: Induced draft fan to pull air through the secondary clinker cooler

Expansion in the autoclave averages about 0.25, well within the allowable limits.

Two B18 Unipulvo mills direct-fire the Wickes 500-hp. auxiliary boiler, two units being installed to take care of wide load variations, A B8 mill fires the clay drier, and two others are provided with interchangeable connections to fire the three stone driers. Two of these driers are operated at one time. The intake air temperatures on these units range from 500 to 600 deg. F., with a coal-air temperature of 150 to 200 deg. F. into the driers through Strong-Scott burners.

Other improvements to the kilns and kiln performance include the rebuilding of the kiln hoods and the installation of seal rings on the discharge ends. The feed ends of the kilns were revamped several years ago, with the installation of Stephens-Adamson Redler conveyors. These conveyor-feeders run horizontally beneath the kiln feed tanks and incline upwards to discharge into the kiln feed pipes, thus eliminating surges and insuring a uniform rate of kiln feed. The larger kilns are fed by 9-in. conveyors, and the smaller by 5-in. conveyors.

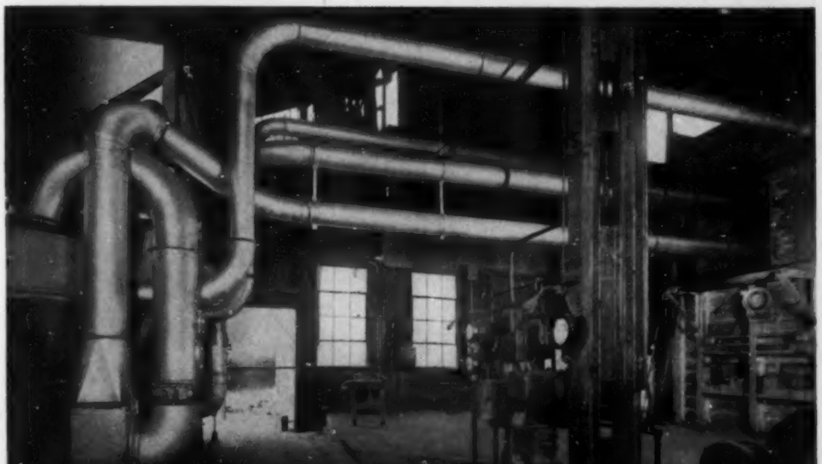
Clinker Cooler Improvements

Clinker from all kilns discharges to a recently-installed 30-in., Union Chain pan conveyor, 220-ft. centers, on the floor below the kilns, carrying clinker up an incline preparatory to discharging to a clinker cooler installed adjacent to the clinker storage building. The clinker temperature is 900 deg. F. as it comes off the recuperator plates, and averages about 800 deg. F. on the pan conveyor.

The discharge is over a 3- x 10-ft. Allis-Chalmers, single deck vibrating screen with ⅜-in. openings installed for the purpose of separating out the larger clinker for passage through the 6- x 80-ft. cooler and by-passing the fines. At present about 85 percent of the screening surface is blanked off, and all clinker retained on the screen goes into the cooler. The cooler, which is baffled and water-cooled for its entire length, except around the drives, is operating under forced draft through a 20,000 c.f.m. Norblo fan connected with a cyclone dust collector, and is effective in reducing clinker temperatures during the summer months to about 120 deg. F. Cooled clinker and clinker by-passing the cooler are placed in storage by separate bucket elevators. Storage capacity is 150,000 bbl. of clinker.

Another improvement completed several years ago, was the substitution of a single 300-ft. reinforced concrete kiln stack, built by the John P. Boland Co., for the short individual stacks and construction of precipitating chambers to trap much of the dust which normally would discharge to the atmosphere. Operated in connection with each kiln is a Wickes waste heat boiler and Greene fuel economizer. The gases formerly discharging to the stacks after passage through the fuel economizers are now routed by a single duct through two expansion chambers to the single stack.

Ducts and expansion chambers were designed by the company engineers and constructed of welded steel plate. The expansion chambers merely slow the velocity of the gases and allow the coarser product to drop. About 15 percent of the dust is recovered in the chambers and precipitated into the



View taken from front of No. 1 kiln looking toward waste-heate boiler and the two pulverizers which fire it. The recording thermometers in foreground check temperatures of fuel-air stream to burner in kiln hood

Magnet for removing tramp iron suspended over conveyor taking coal from storage to hammer mill

hopper-bottomed ducts to be reclaimed by a screw conveyor and blended into the kiln feed. About 40 percent of the stack loss is less than 40 microns in size while the dust being recovered is about 85 percent through the 325-mesh sieve.

The remainder of the plant is practically unchanged. Closed-circuit grinding is employed for raw material as well as in grinding cement. In raw grinding, the materials, after blending, are ground to about 50 percent minus 200-mesh in a Hercules mill. The Hercules product is placed in correcting tanks and is then passed through an 8- x 35-ft. tube mill closed-circuited with two 16-ft. Sturtevant air separators. The separator-mill arrangement is a simple closed-circuit system, the rejects returning to the mill with the fresh feed. The final kiln feed is about 90 percent minus the 200-mesh.

In grinding clinker and gypsum, a similar arrangement of a Hercules mill followed by simple closed-circuit grinding is employed. The Hercules product, about 200 bbl. per hr. through a 6-mesh screen, is about 600 to 700 cm^2 per gram and the final standard product averages about 1900 cm^2 per gram. High early strength cement is ground to 2800 cm^2 per gram. Finished cement is stored in a 150,000-bbl. stockhouse or in a new one of 100,000-bbl. capacity.

This unit is filled by a Fuller-Kinyon type C remote-control portable unloader which also serves to reclaim cement for bulk shipments or for delivery to the packhouse.

Industrial Mineral Industries In the Making

An activity of WPA, or at least a use of WPA money, which hasn't received much publicity, is assistance to state geological surveys and other government agencies in discovering or advertising mineral resources. Since most workable metal-ore deposits are well known, this activity has consisted largely in calling attention to numerous industrial minerals, or rock products, of which the general public knows little. Of course, those in these industries know that the markets for such minerals as barite, tripoli, mica, feldspar, talc and many others, are few and very limited; and that in general, existing capacity to produce greatly exceeds existing demand. Nevertheless, the work of discovering new deposits and of studying methods of treatment or use is constructive. No one knows what new uses may be found for some of these minerals.

A part of TVA activities has been geological surveys of mineral resources; another part has been actual development of Tennessee phosphate rock deposits and of methods of processing rock phosphate to make phosphoric acid for fertilizers. Through the use of WPA money and labor, the Tennessee Department of Conservation, Division of Geology, has published seven reports by George I. Whitlatch as follows: (1) Tripoli; (2) bauxite; (3) limestone; (4) manganese; (5) moulding sand; (6) clay; (7) barite. These are rather simple reports aimed to be read by laymen and possible enterprizers, and contain some information on the uses of the minerals, although they are primarily intended to describe the various deposits.

The War Department has done a similar job in the Pacific Northwest in connection with studies to find possible markets for the electrical power to be generated by the Columbia River dams. Edwin T. Hodge, consulting geologist, has written comprehensive reports on (1) limestones; (2) silica; (3) clays; (4) magnesia (or more properly magnesite). Some of these reports cover the territory adjacent to Boulder dam power plant also.

It is obvious that we have hardly scratched the surface in uses for many of these industrial minerals. An example of this is ground mica. This material has long been used for Christmas card ornamentation, etc. Because mica remains flakey, however finely ground, it makes an excellent "covering" material or filler in paints. But it has to be ground in a certain way, and grinding mica is difficult in any way, because it acts almost like a lubricant. Paul M. Tyler, chief engineer, Nonmetal Economics Division, U. S. Bureau of Mines, has written a very full report on this subject recently.

An outstanding example of a mineralogical curiosity converted by research "into an industrial item of great economic significance" is diatomite or diatomaceous earth. The part that Johns-Manville has played in developing the famous Lompoc, Calif., deposits is told in a recent booklet "After 50,000 Centuries Research Puts the Diatom To Work." Another interesting discussion of the same subject is "Dicalite Aids To Industry," published by The Dicalite Co.

Three unit pulverizers firing three rock driers and one clay drier

Interlocking Control for Screens and Conveyors

Flexible Design Facilitates Production of Numerous Stone Sizes

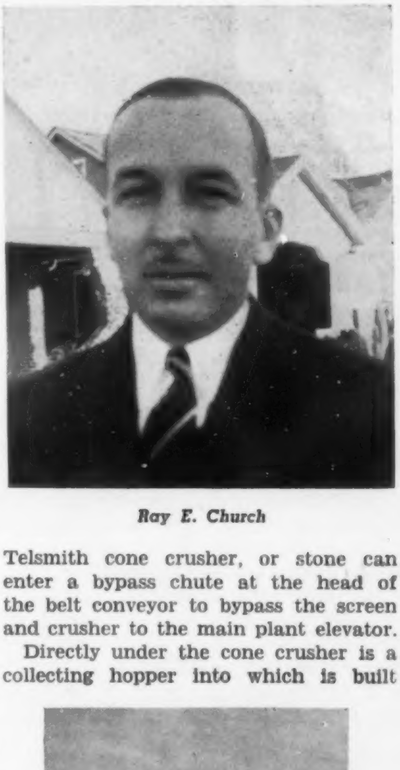
By RAY E. CHURCH*

A new crushed stone plant was built near Louisville, Kentucky, early in 1938 to replace one constructed in 1918. The old plant was located on the Brownsboro road east of Louisville. Construction of a new road and close proximity to a recently developed, high class subdivision, whose residents objected to the old unsightly plant along the highway, were deciding factors in the decision to build the new plant. It is now located down on the quarry floor out of sight of the road. The new location also has cut down a long haul. The face of the quarry averages 80 ft. and the plant is located within 300 ft. of the face.

Trucks Deliver Rock to Crushers

Although the plant is small and none of the stone is washed, its cycle of operation is flexible and efficient. Men in the quarry are paid on a piece work basis for the hand loading of stone into Dempster "dumpsters" for delivery to the plant. The light "dumpsters" each have $1\frac{1}{2}$-cu. yd. capacity, and are hauled by two International trucks to a No. 6, style N, Gates primary crusher, normally set at $3\frac{1}{2}$ in. The crusher is driven by a 75-hp. motor.

An 18-in. belt conveyor, 74-ft. centers, carries the crushed stone to a primary screen house independent of, but adjacent to, the main plant. At the head of this conveyor is a 3- x 8-ft. double-deck New Holland scalping screen with $2\frac{3}{4}$- and $1\frac{1}{4}$-in. square openings on the top and bottom deck screening surfaces. The screen has a flop gate that will send either plus $2\frac{3}{4}$-in. or plus $1\frac{1}{4}$-in. stone to a 36-in.



Ray E. Church

Telsmith cone crusher, or stone can enter a bypass chute at the head of the belt conveyor to bypass the screen and crusher to the main plant elevator.

Directly under the cone crusher is a collecting hopper into which is built the bypass chute, the hopper loading directly into the boot of the main elevator. The elevator, of the bucket and continuous belt type operating on 52-ft. 6-in. centers, carries all minus $2\frac{3}{4}$-in. stone to the top of the plant. Here the elevator feeds to a 24-in. cross belt conveyor, 18-ft. centers, which in turn feeds a 3- x 12-ft. Symons double-deck, horizontal vibrating screen.

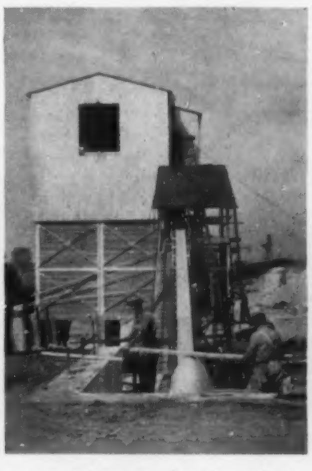
Flop Gates Promote Flexible Operation

Flexibility in the plant is obtained through the use of numerous flop gates to divert proper size gradations into the various bins. The top deck of the screen has $\frac{3}{4}$-in. cloth for the first 7 ft. of its length followed by 5 ft. of $2\frac{3}{4}$-in. cloth; on the lower deck, 3/16-in. cloth is used on the first 6 ft. 6 in. of length, followed by a 6-in. open space and 5 ft. of $1\frac{1}{4}$-in. cloth at the discharge end. The stone sizes produced are No. 2, $2\frac{3}{4}$ by $1\frac{1}{4}$ in.; No. 4, $\frac{3}{4}$ by $1\frac{1}{4}$ in.; No. 8, 3/16 by $\frac{3}{4}$ in.; No. 9, minus 3/16 in. (dust); No. 6, 3/16 by $1\frac{1}{4}$ in. (No. 4 and No. 8 combined).

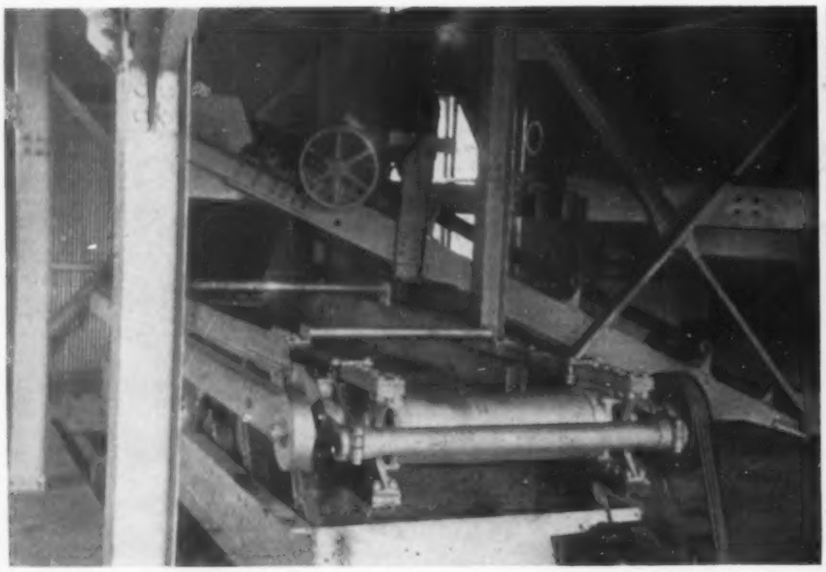
To meet a heavy demand for No. 2 stone under normal operating conditions, there are no returns to the secondary crusher. However, the front top deck section of the Symons screen has a $2\frac{3}{4}$-in. cloth so that in event of breakdown of secondary crusher or primary scalping screen, No. 2 stone can be produced, the plus $2\frac{1}{4}$-in. going to bin while repairs are made. When the demand is for either No. 8, No. 4 or No. 6 stone, everything over $1\frac{1}{4}$ in. in size is chuted direct to the crusher from the screen. This chute has a flop gate to enable filling an extra bin with No. 2 stone when it is not acting as a return chute to the reduction crusher.

Generally, No. 9 stone and No. 8 stone go direct to bins, but the main chute to No. 8 stone bin has a flop gate which permits loading another bin that is normally used for No. 6 storage. Beneath the horizontal screen at the opening in the lower deck is a flop gate, which, in one position, sends No. 8 stone to the bin but when flopped over sends No. 8 stone into the No. 4

* President, Church Engineering Co., Cincinnati, Ohio.



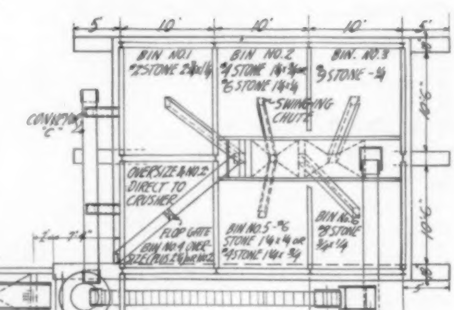
Left: Dumping floor at primary crusher. Center: Conveyor taking crusher throughs to scalping screen. Right: Main bucket elevator, primary screen, and secondary crusher house

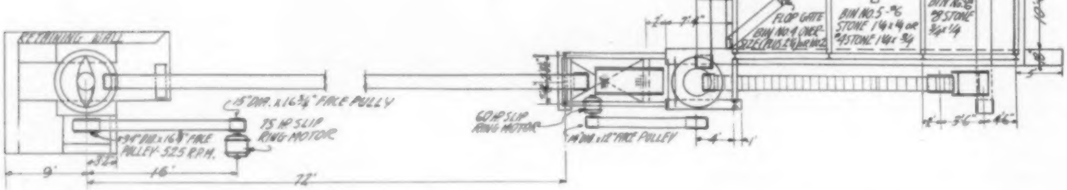


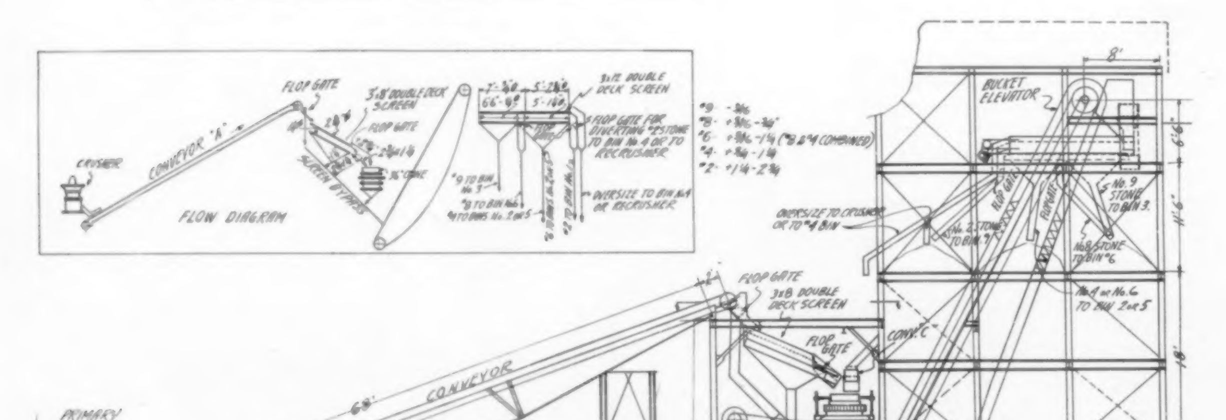
Above: At the top of the plant is a 3- x 12-ft. double-deck screen. Note cross conveyor

Upper Right: Loading leg of main elevator, showing by-pass chute in front and collecting hopper under 36-in. cone crusher in rear at top

Below: Plan and elevation of new Jefferson County stone plant







hopper to make No. 6 stone. A pants leg chute below the No. 4 hopper permits No. 6 or No. 4 stone to go to either of two bins.

No. 2 stone coming from the screen can go to either of two bins, either of which can be used for storing No. 2 or No. 4 stone. For added flexibility, an 18-in. belt conveyor and a short bucket elevator will be installed to draw stone from these two bins for re-crushing so that additional fine sizes can be produced when the main crusher is not in operation.

A 5-ton monorail services the top of the plant, and each crusher has its individual monorail for removing crusher heads. The screen hoppers are built

View of quarry with trucks loading at the quarry face, primary crusher and stone plant

Hugh N. Wood, county engineer, to the left, and Tom Nugent, president, Louisville Sand Co., to the right

to accommodate a 4-ft. wide screen, to be installed later.

All equipment used, with the exception of the belt conveyor carrying stone from the primary crusher, was taken from the old plant or from equipment purchased from the City of Louisville workhouse quarry, which had been abandoned. The six bins, built with 2- x 6-in. rough pine timber walls, each has a capacity of 115 tons, heaped.

Interlocking Control for Screens and Conveyors

All control equipment is the latest type Westinghouse equipment, using Westinghouse Deion combination line starters and air circuit breakers. The controls for the Symons screen, 16-ft. belt conveyor and main bucket elevator are interlocked so that the bucket elevator cannot be run unless the screen and conveyor are running first. Push button control stations are located at the top of the plant for these three units and also at the main compressor house. The primary crusher has an emergency stop station at the crusher floor.

Air is furnished for secondary drilling by a new 300-cu. ft. Le Roi-Rix compressor, V-belt driven by a 100-hp. motor.

Blasting is limited to 50-lb. charges because the quarry is located near a residential district. Windows on the side of the plant facing the quarry were omitted and a 2-in. thickness of planking was installed on the roof of the main plant as a protection against damage when blasting.

The new stone plant, a project of Jefferson County, Ky., was built under the direction of Hugh N. Wood, Jefferson county engineer. Church Engineering Co., Cincinnati, Ohio, designed the plant, including all foundations, steel work, machinery arrangement, and control equipment. They also supervised the installation of all machinery, chutes, hoppers and bins.

Capacity of the plant is 75 tons of crushed stone per hour. In 1938 it is estimated that 75,000 to 100,000 tons will be used in construction on county road projects, the outlet for which the plant was built.

Left: Collecting hopper at scalping screen. Right: Scalping screen by-pass chute and collecting hopper, and cone crusher

Gravel For Track Ballast

By **STANTON WALKER***

Properly prepared gravel ballast of good quality is low in first cost and the expense of placing and maintenance also is low. Gravel constitutes 61.5 percent of the total ballast used since 1926.

Specifications of the American Railway Engineering Association are generally accepted by the railroads as a guide in drawing up specifications of the individual railroads. Realizing the inadequacy of specifications for ballast, the A.R.E.A., in coöperation with the National Sand and Gravel Association drew up recommendations for specifications which were accepted in 1926. Since then the fundamentals have been retained in the A.R.E.A. Specifications for Prepared Gravel now in effect.

Characteristics which would be possessed by a high grade ballast include the following: Particles should be sound and durable; particles should be sufficiently hard and strong to resist crushing by static and impact loads of railroad traffic; ballast should be graded uniformly; ballast should be stable and offer resistance to shifting so that track will stay in alignment; gradations should be such as will afford proper track drainage; ballast should be clean and dustless; and ballast should be graded so that it will not easily foul.

Any measures of the characteristics listed above are, of course, relative and not absolute. Different ballasting materials possess those characteristics in a greater or lesser degree. In evaluating their importance, careful consideration must be given, of course, to first cost and to the costs of placement and maintenance. It may be more economical to use one ballast for the work at hand than another, because of its low cost, even though the first will not rate as high as the second in a consideration of its physical characteristics. A good grade of prepared gravel ballast, not only ranks high as to quality, but it also represents a material of relatively low first cost and low cost of placing and maintaining.

It will be observed that the principal factors to be covered in specifications are: grading and uniformity of grading; cleanness; soundness and durability; and hardness and strength. The current specifications of the A.R.E.A. touch on all of these factors. With respect to grading and uniformity of grading, the specification is shown below:

Three classifications are provided which, for want of a better measure of angularity, depend upon the percentage of crushed particles. Gravel containing a large proportion of angular particles does not require the finer material to provide stability, whereas rounded gravel needs the finer sizes introduced into the voids to prevent "ball bearing" action and a shifting track. To prevent poor drainage characteristics, the finer sizes must be controlled. On the other hand, a ballast with uniformly large sized material may provide good drainage at first, but the large voids permit entrance of cinders and other foreign material which will block drainage.

A.R.E.A. specifications limit the amount of material finer than 200 mesh to 1 percent, clay lumps to 0.5 percent and soft and friable particles to 5 percent. The sodium sulphate test is used to measure the soundness and durability of aggregates, and the modified Deval abrasion test is employed as a measure of hardness. While there are no limitations specified, other specifications call for 15 percent loss for rounded gravel and 25 percent loss for gravel consisting entirely of crushed particles. The specification does state that the percentage of crushed particles is to be determined for the material coarser than a No. 4 sieve and that a crushed particle is to be considered as one having one or more faces resulting from fracture.

AMERICAN RAILWAY ENGINEERING ASSOCIATION SPECIFICATION COVERING GRADING

Size of Square Opening Sieve	Percents Passing Each Size: 0% to 20% Crushed		21% to 40% Crushed		41% to 100% Crushed	
	Max.	Min.	Max.	Min.	Max.	Min.
1½ in.	...	100	...	100	...	100
1 in.	100	80	100	65	95	65
½ in.	80	50	75	35	50	25
No. 4	40	20	35	10	15	0
No. 8	35	15	10	0	5	0
No. 16	25	5	5	0	...	...
No. 50	10	0	...	...	...	...
No. 100	2	0	...	...	...	...

Pit-run gravel also is covered in A.R.E.A. specifications with respect to grading in two classifications:

Sieve Size Square Openings	Amounts Finer Than Each Size Percents by Weight: Grade A	Grade B
2½ in.	97 to 100	97 to 100
No. 4	20 to 55	20 to 65
No. 200	0 to 2	0 to 3

In 1929 a questionnaire was sent to the railroads on the question of the comparative merits of ballasting materials, and "washed gravel" was placed second in order of it. This aroused considerable objection on the part of a number of railroad engineers. After analysis of the replies, the A.R.E.A. committee recommended that comparative merit qualifications for ballast be eliminated from the manual.

About the same time the A.R.E.A. also reported on tests of the physical characteristics of ballast which were carried out in the laboratory of the National Sand and Gravel Association. To supplement these tests, a questionnaire was sent to railway engineers who were familiar with the gravels which had been given laboratory tests, seeking their experience with these materials from the point of view of hardness, durability, drainage, stability, maintenance cost, etc.

The replies, in the main, were highly pleasing to the gravel industry. It was stated of one uncrushed gravel, containing a fairly high proportion of coarse sand, that it gave plenty of track support and resistance to breaking down under traffic; tamping had no effect; held track to good line and surface; offered plenty of resistance to displacement; showed no disintegration; shed large part of rainfall and showed good drainage of penetrating water; and was generally used about 15 years before it became dirty enough to require replacing.

It was said of one of the less favorable ballasts, of small size, few crushed particles, and containing little or no sand; that it was not so stable; contained rather small, smooth and rounded particles; rolled easily; very durable; drainage very good; principal difficulty was maintaining surface and line; gets set after two or three years and is not so much trouble.

Most of the answers to the questionnaire, however, were favorable as to strength, stability, durability, and drainage. On the need for maintenance, about half the replies were classified as fair with the balance equally divided between good and bad.

*An abstract of a paper presented before the National Sand and Gravel Association.

Rockwool Manufacturing Possibilities In Michigan

By O. F. POINDEXTER

Associate Geologist, Geological Survey Div. Dept. of Conservation, State of Michigan

During the summer of 1937, in connection with a new report on limestones of the state, the Michigan Geological Survey made a reconnaissance survey to determine what formations and localities offered possibilities for supplying raw materials for the manufacture of rock wool. Previous surveys of the mineral deposits of the State have resulted in the accumulation of considerable information relative to the location, extent, depth, physical and chemical characters of the deposits of limestone, dolomite, sandstone, shale, clay, and marl.

Since rock or mineral wool is a compound of the oxides of calcium (lime), magnesium, aluminum and silicon in characteristic proportions, it is apparent that rock wool can be manufactured from mixtures of the above mentioned rock or soil formations with proper control of mixing, melting, and blowing operations.

There are obvious advantages, however, to a naturally occurring mixture of compounds yielding these oxides, of sufficient uniformity in composition to permit obtaining the wool materials in a single quarrying operation, provided, of course, that the deposit is favorably located with respect to transportation facilities and manufacturing or consuming centers.

These naturally occurring deposits having a chemical composition similar to that of rock or mineral wool are known as "wool rock." They may consist of a cherty, flinty, sandy, or shaly limestone or dolomite in which the impurities are more or less intimately mixed with the calcium and magnesium carbonates. When the sandy and shaly phases predominate these grade into limy or dolomitic sandstones and shales. Certain deposits consist of thin alternating beds of limestone and shale, or a fairly thick bed of limestone sometimes rests on a shale below. These latter types of materials, while not woolrocks in the sense of properly proportioned chemical mixtures, offer possibilities in that all chemical requirements can be obtained in a single quarrying operation.

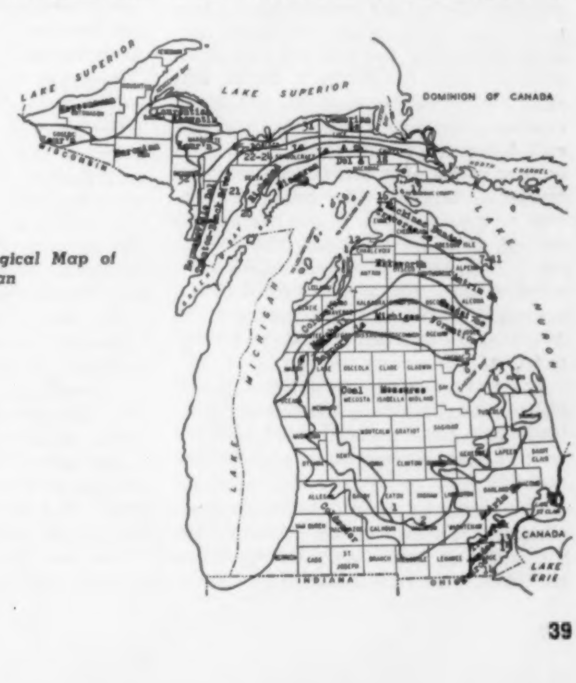
Past surveys have disclosed the presence in Michigan of large deposits of pure limestones and dolomites, as well as extensive beds of shale, clay, and marl. Based upon their chemical composition, reaction to burning, and other tests, certain definite uses were indicated for these materials. In the case of limestones and dolomites, emphasis was placed upon the "high calcium" or "high magnesium" character of the stone in relation to its adaptability for the various chemical purposes. In addition to the pure limestones and dolomites and those of intermediate character, it was discovered that there are extensive deposits of limestones and dolomites characterized by the presence of large quantities of silica, clay, or shale. These were previously considered to possess little or no value except possibly that of a natural cement rock.

Since descriptions, analyses, etc., of the higher grade limestones and shales of the State have been published and are available to the public through the reports of the Michigan Geological Survey, the reconnaissance survey of the past summer was confined to those formations or members which, because of their impure character, hitherto had been considered of little value. It was believed that portions of these formations could be classified as either natural "woolrock," "sub-woolrock," or "rock mixtures."

The State of Michigan has a unique geological structure. Due to its "basin" structure and the generally heavy cover of glacial drift, the more extensive areas of rock outcrop in the Lower Peninsula and the eastern part of the Upper Peninsula are found near the shores of the Great Lakes. The larger deposits of limestone and dolomite occur along the north shores of Lakes Michigan and Huron. Limestone areas in the southern part of the State are much less numerous and less extensive, but these are nearer to industrial centers and some are located near the lake shores. In spite of their distance from manufacturing centers, the large deposits of the northern part of the State, owing to availability of low cost water transportation, occupy positions equally as advantageous as some of those situated much nearer to consuming centers. In fact, the nearness of large deposits of pure limestone to the shores of the Great Lakes has been the determining factor in the development of Northern Michigan into one of the world's greatest sources of supply for this material.

For the preliminary report, tests were restricted to a determination of the carbon dioxide content of samples of rock from various formations.

Analytical and experimental research on limestones, dolomites, and shales conducted by the Illinois Geological Survey[1] has shown that CO_2 contents of 20 and 30 percent may be satisfactorily established as the limits for a woolrock. In other words, nearly all varieties of stone having CO_2 equivalents which fall between these limits will yield wool when subjected to experimental blowing tests. A preliminary classification of



Generalized Geological Map of Michigan

Legend
Ls—Limestone
Ss—Sandstone
Sh—Shale
Dol—Dolomite
22—Sample Location

TABLE OF MICHIGAN FORMATIONS (GENERALIZED)
WITH CHIEF PRODUCTS OF ECONOMIC IMPORTANCE

Formation or Group	Economic Products
Pleistocene:	
Glacial Drift	Clay, sand, gravel, marl, peat, fresh water supplies
Pennsylvanian:	
Coal Measures	Shale, sandstone, coal, fresh water supplies
Mississippian:	
Bayport formation	Limestone, shale, sandstone
Michigan "	Gypsum, natural gas, limestone
Marshall "	Sandstone, natural brines
Coldwater "	Shale, brines
Ellsworth "	Shale
Berea "	Petroleum and natural gas, brines
Antrim "	Shale, fresh water (locally), natural gas (locally)
Devonian:	
Traverse group	Limestone, shale, petroleum, and gas, fresh water (locally)
Dundee formation	Limestone, petroleum and natural gas, sulphur water, brines
Devonian and Silurian:	
Monroe group	Limestone, sandstone, sulphur water, brines
Silurian:	
Salina formation	Rock salt, gypsum
Niagaran Series	Limestone, dolomite, fresh water (locally)
Ordovician:	
Richmond formation	Shaly limestone
Trenton-Black River groups	Limestone, fresh water (locally), petroleum and gas
Ozarkian:	
Hermansville formation	Sandy dolomite
Cambrian:	
Lake Superior formation	Sandstone, fresh water
Pre-Cambrian:	
Huronian Laurentian Keewatin	Slate, marble, serpentine, talc, feldspar, granite, sandstone, trap rock, graphite, iron ore, copper, gold, silver

deposits can be made on this basis and only those samples which have the specified CO_2 content reserved for complete chemical analyses and experimental blowing. Deposits which have a CO_2 content of between 20 and 30 percent are classed by the Illinois Survey as "woolrock." Those having CO_2 content of from 15 to 20 percent and 30 to 38 percent are classed as "sub-woolrock." These latter require the addition of small amounts of "flux rock," to bring the composition within the required limits.

Procedure in Determining CO_2 Content[2]

The entire sample weighing about 5 lb. was crushed to pass a screen with ¼-in. openings. The crushed material was then coned, quartered, and one-quarter selected for pulverizing to pass a 20-mesh sieve. Three one-gram portions were then weighed out into silica crucibles and heated in a muffle furnace for several hours at 400 deg. C., to eliminate moisture and constituents volatile below this temperature. This process was repeated to satisfactory constant weight of samples. The oven temperature was then raised to 950 deg. C. for several hours for calcining, which process was repeated to approximately constant weight. The loss in weight of the sample between the temperatures of 400 deg. C. and 950 deg. C. was computed as CO_2.

For a check on results obtained at the different temperatures, samples of chemically pure $CaCO_3$ were heated with the unknown at temperatures of both 400 and 950 deg.

Wet method determinations, using an alkalimeter, were run concurrently with the calcining operations. It was found that results varying ordinarily not more than one or two percent from those obtained through the burning tests could be expected. This demonstrated the practicability of the alkalimeter method for field use and for laboratory determinations where rapid results of an approximate nature are desired.

In a search for woolrock the wet method might have a value for field use, to reduce the number of samples necessary to ship to the laboratory. Only those samples which the rough field tests indicated as promising need be reserved for laboratory testing.

Anyone could be quickly trained to use the alkalimeter method, and the equipment necessary is small and relatively inexpensive. A kit containing a small hammer, mortar and pestle, several alkalimeters, portable balance, concentrated hydrochloric acid, and alcohol for cleaning and drying the alkalimeter would include the principal items of equipment and materials.

Sampling of the various formations was guided by the large number of analyses already in the files and publications of the Geological Survey. This data together with more recent analyses was presented in the report as a tabulation which covers the county, locality, age of rock formation, kind of rock, thickness, CO_2 content, classification, and transportation facilities.

No attempt was made in this report to cover all materials available for rock mixtures. Detailed information may be found in other published reports covering the limestones[3] and clays[4] and shales of Michigan.

The tabulation did not include results of any tests made on clays, marls, or sands, of which enormous quantities of high grade materials exist in the State. These may become of importance due to their ease of excavation should satisfactory methods of preparation and handling be devised.

It is possible that prospective rock wool manufacturers may find it more convenient and economical to purchase standard grades of limestones, sandstone, and shale or other materials from large concerns in the general stone business who can deliver stone much more cheaply than an operator of a natural woolrock quarry at some distance from the manufacturing and distributing center. The additional cost of preparing and controlling the mixture would be offset by savings in quarry costs.

The bulk of the lime now burned in Michigan is made from stone purchased from limestone producers in Northern Michigan and manufactured in large distributing centers.

Conclusions

A preliminary study of Michigan formations indicates that the most promising localities for natural woolrock are found in Alpena, Monroe, Arenac, and Huron counties in the Southern Peninsula; and in Alger, Dickinson, and Delta counties in the Upper Peninsula. Sub-woolrocks are available at many points, and in several places associated limestone and shale beds will apparently yield the proper composition when mixed in correct proportions. Two quarries may have waste rock which is woolrock or sub-woolrock.

The argillaceous limestone beds of the Lower Traverse series in Alpena County and the lower beds of the Hermansville dolomite in the Upper Peninsula appear to be the most definitely proved woolrock formations. More analyses are, however, available for these than for any other beds. The Randville dolomite of Dickinson and its equivalent in other counties is very promising, but further sampling is necessary. The lower beds of the Detroit River formation and the upper beds of the Sylvania sandstone, upon which the former rests, appear to be woolrocks, but further field studies are needed in Monroe and Wayne Counties to determine the localities at which these beds outcrop. Due to the peculiarities of the Huron-Arenac deposits the preliminary sampling was not entirely satisfactory. Careful foot-by-foot sampling at several points along the face, or core testing, will be necessary to get representative samples of the deposits.

Similar sampling difficulties are encountered in the very cherty dolomites of the Niagaran series in Mackinac, Chippewa, and Schoolcraft counties. These deposits warrant further investigation.

[1] Bulletin 61, Illinois Geol. Surv., p. 227.
[2] The CO_2 determinations not credited to other authorities were made by Harold V. Fairbanks of Michigan State College.
[3] Pub. 21, M.G.S. (1915).
[4] Pub. 36, M.G.S. (1926).

Preventing Kiln Troubles By Finding Cause

By W. S. DICKIE*

One of the most surprising disclosures of this investigation or gathering of information is the fact that some of the oldest users of kilns are, perhaps unconsciously, among the greatest abusers. We are rather inclined to expect a concern or person who has worked out an entirely new use for a rotary kiln to be inexperienced in the proper care of it as a piece of machinery and to abuse it until it is learned by bitter experience what should not have been done; but we are not so inclined toward those who have used them for as much as 40 years.

We must, in fairness, acknowledge the fact that greater abuse is given the machine where only one or two are used by a company, and even more so where the kiln is not a vital piece of equipment in a process as it is in the production of portland cement and lime. In some cases the rotary kiln is used only in the treatment of a material which, while important in the whole process, is not the salable product of the plant, as witness its use in the reburning of lime from paper mill sludge. Here, it is to be regretted, the rotary kiln is considered "a necessary evil."

Kilns Are Temperamental

Some years ago the writer, in talking to someone about rotary kilns, mentioned the fact that in many users' minds the kiln is considered "a hulk of a machine." Actually it has proven to be quite a temperamental piece of equipment as subject to whims as a prima donna. For proof of this consider a battery of four or more kilns where jumpy or jerky revolving is experienced. For some reason one kiln starts revolving in this way and just as unaccountably stops and another kiln starts. In spite of the 21 reasons for this, which will be given in a later article, it seems impossible to ascribe a cause for it, although one must exist. There have been many instances where a sacrifice has been made in the operation of the kiln to overcome this objectionable condition rather than to spend time and perhaps money to cure it.

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Another thing which has been observed is the disposition among not only the users of rotary kilns, but users of all types of machinery, to cure the effect rather than to find the cause and take measures to cure it. It has always seemed more expensive to work on effects than causes because the cure of an effect is seldom permanent. In a great many cases, curing an effect has caused trouble at other points in the same piece of equipment. Usually when an effect is cured there is an effort made to make that particular part stronger than it was, resulting in a proportionate weakening at another point with consequent breakage. Strange as it seems, when this argument is presented to an operator, he will agree that the cure of the cause is not only good common sense but also good business sense. On the other hand, and in spite of his agreement on the point, he does not practice it.

Kiln "Diagnosis"

For some years the writer has been gathering information concerning kiln troubles, partly because it was made necessary by his work and partly because it seemed expedient to do so. By questioning executives, engineers, and operators it has been learned that dissemination of this information is desirable—in fact, badly needed.

Therefore this series of articles was written, the thought being that in the process of gathering the information there was an advantage in hearing of the troubles encountered and the cures applied in a large number of plants using rotary kilns, whereas the owner or operator has had only his own private troubles and cures. And, as is the case in the practice of medicine where the cure (so-called) is not necessary if the trouble is avoided or prevented, the reading of these articles may serve their purpose in eliminating the need for cures by preventing troubles from occurring.

The actual money value of this is one of the things hard to put into dollars and cents, as it is not only costly to make the necessary shutdowns for repairs, both in the cost of the repairs themselves and in the loss of the product, but also a kiln operated at its best mechanical efficiency operates at the lowest cost per unit of production.—THE AUTHOR.

Installing two 10- x 200-ft. kilns in a modern cement plant

This does not necessarily mean expensive work on repairs, because in most cases a little careful thought and a working backwards, together with the use of a little common sense and the mechanical knowledge that all operators must have, disclose the fact that what has appeared to be a mountain is really a molehill. There have been times, it must be acknowledged, when all theorizing or the application of all past experiences has failed to give the reason for something which has happened. A case in point is one where, through a break in a power supply line because of a storm, the kiln was suddenly stopped. Ironically enough this happened at midnight, the time when a minimum of employes was on hand.

Badly Bowed Shell Caused By Power Failure

Either the kiln burner did not recognize the importance of keeping his shell moving, at least at intervals, until it cooled down sufficiently or no means were at hand to accomplish this; at any rate it resulted in a very badly bowed shell. There is, of course, a cure for a bowed shell, but the bow must not be too bad. In reply to the kiln user's inquiry as to how to straighten his shell, the statement was made by the writer that it would be impossible because of the extreme bow except by cutting the sections apart, turning them to their best positions, and reriveting them. However, he did tell the user how shells were straightened when the bow was reasonable. Later he was called and

told that they had succeeded in straightening the shell to within three-quarters of an inch of concentricity in revolving.

Then a short time later, suddenly and without any theoretical cause, the rivets started to pop, that is to break off just under the outside head. An investigation into the possible reasons for this disclosed other cases of shell rivets popping off. Talking with other operators, however, revealed the fact that, while similar results were experienced, there were many and different causes.

Reriveting Is the Only Cure

In a plant in a rather cold climate where a kiln was housed in a leanto, open on one side to the weather and with the closed side against the wall of a heated building, the kiln was fired during a cold spell after having been down for a short period. As soon as the fire on the inside became hot enough, the rivets did the same thing as on the badly bowed shell. It has never been determined, so far as the writer knows, what caused the trouble in any of these cases and, so far as we know, reriveting is the only cure.

On another kiln, which is somewhat special in that the temperature used is comparatively low and the shell revolves at an exceedingly slow speed, there was experienced a shearing of rivets on the circular joints in a portion of the shell. Here the shell was insulated and, since the operating temperature was low, the shell was almost cold when the kiln was in operation.

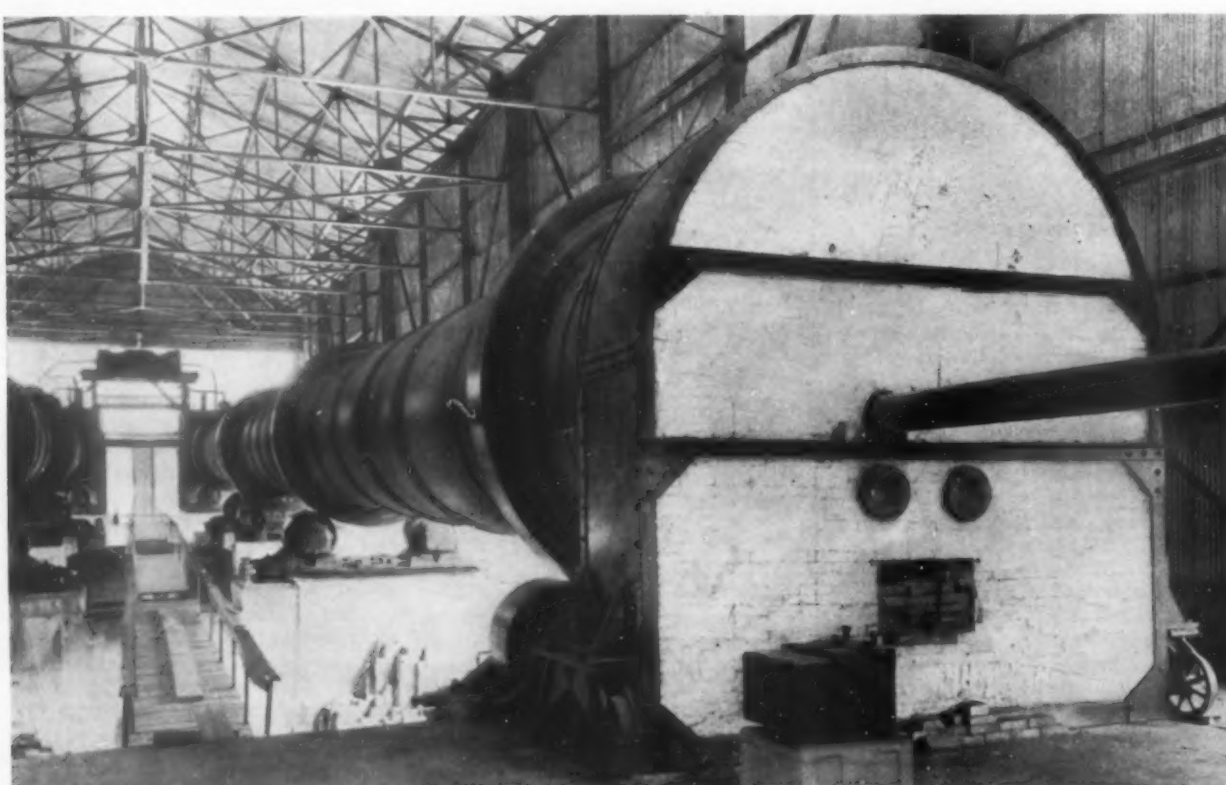
The first thought in this case was that only one thing could have caused the shearing of rivets on the circular butt straps, and that was heat. If the shell had been hot enough to expand to a larger diameter with a tendency for the butt straps to remain at their former diameter, then shearing of rivets might have taken place. One of the theories applied was that the insulation might have worn thin or been compressed, with the result that a channel for hot gases was made between the steel shell and the insulation. Further, there was an opening somewhere in the refractory lining which allowed hot gases to enter this channel. When holes were drilled through the shell at a number of points and measurements taken, it was found that there was no channel. This made the theory useless since evidently the shell had not been hot enough to cause any such effect.

A second theory supposed that, because of the very low speed, the reactions in the shell, which are present in all shells, were magnified. This theory had to be discarded since other kilns in the same plant and in service longer did not show any signs of giving trouble. The answer to this problem has not yet been arrived at and perhaps never will.

Too Much End Thrust Causes Tire Rod Weld Failure

In contrast let us take another case where the welding broke loose on the bars which hold the tire from moving longitudinally. The first conclusion, and of course the easiest to come to, was that the welding was defective or not heavy enough to stand up under the duty imposed upon it. However, it was seen that the faces of tire and rollers were badly grooved and, working backward from effect to cause, it was not hard to determine that undue end thrust had developed. After the tire had been rewelded, the roller was refaced and bearings carefully adjusted with the result that there has been no further difficulty.

Still another case where the cause of trouble was easily discovered and a cure effected is one where one tire and the rollers of its supporting bearings were showing evidence of wear which might have been attributed to poor steel castings. In the course of the investigation of this problem, which included an analysis of the steel as well as an analy-



Firing end of kiln with portable control stand, controller for slurry-feed and pulverized-coal-feed motors

sis of the flakes that were coming off as the shell revolved, it was finally found that the operator adjusted only the set of bearings at the thrust bearing to take up the entire end thrust due to the inclination of the kiln. As can be seen, this one set of rollers had to be canted at a great angle, which resulted in enormous friction between tire and rollers, making the wear greater than should be expected and producing the flakes, which usually scare the operator. By the way, the analysis of these flakes showed that, for the most part, they consisted of the material in the dust surrounding the kiln.

It is hardly necessary to give a description of a rotary kiln to those who read this magazine, but because there is such a variety of names for the parts making up a kiln it might be a good idea to give a brief description, calling each part by a name which will be used in succeeding articles.

First, of course, is the shell, which usually includes the steel plate of the shell proper, the various reinforcements under tires and gear, the rubbing bands or reinforcements under the rotating part of seal rings, the retaining head at the feed or cold end, and the nose ring assembly at the discharge or hot end. Next are the tires, which may be of one of a number of designs, together with the tire fastenings which ordinarily consist of supporting or spacer blocks and side or keeper rings or blocks. The tires are carried on sets of supporting or roller bearings which include the pedestals or cradles with their rolls and shafts. On one set of these bearings is mounted a set of thrust bearings, the duty of which is to take care of the end thrust of the shell. The gear ring, which is mounted on the shell, may also be of varying design but usually is of the design known as "T" section where the gear, made in halves, is bolted to a supporting flange of inverted "T" section, this latter piece being directly attached to the shell or reinforcing band. The gear ring meshes with the main pinion of the underneath driving gear, there being two types of driving gear in use today, the older or open type and the newer or enclosed type with variations in designs of both. At the discharge or hot end a firing hood is used. This may be either movable, as is usually the case, or stationary. Finally, the shell at the feed or cold end projects into a stack or dust settling chamber. No doubt other parts will be mentioned farther on and, as they are, their position in the kiln assembly will be given to preclude doubt as to the part referred to.

While it is generally supposed that the first use of a rotary kiln was in the cement industry, this is probably incorrect. Although there is no accurate record of the first experimental installation, it was thought to be for use in the treatment of black ash. This was about the year 1848 and the experiment was not very successful. Neither were the attempts of the next few years any more so, but finally the difficulties were overcome and the "revolver" came into popular use in the alkali and several other industries. The adoption of the kiln in the chemical and metallurgical industries was a very slow process, although it has always seemed strange to the writer that the industry which pioneered in the use of the kiln should not be the greatest user. However, its use is increasing day by day in these industries. New uses for kilns also are being developed.

In writing of the causes and cures throughout this series of articles reference is made to only the rotary kiln. The same things in all respects apply to rotary dryers and coolers and to the many modifications of the kiln such as roasters, retorts, calciners, etc. There may, of course, be differences in the details of parts, but anything stated may be applied because the function of the parts is the same.

Determination of Free Lime

By J. W. DENNIS
Chief Chemist, Consolidated Cement Corp.
Fredonia, Kan.

Since Emley developed an accurate method for the determination of uncombined lime there has been a great amount of work done on this subject. Lerch and Bogue studied the method and found it to be accurate so they revised and refined the procedure for use in cement laboratories. The revised procedure, while accurate, is very slow; a determination requiring from five to eight hours.

In 1931, H. R. Brandenburg proposed the use of an addition of barium chloride as an accelerating agent. By this means the time required for completing a determination was shortened to about one hour.

Since that time there have been several methods developed in which ethylene-glycol is used as the lime solvent. This method is somewhat faster than that proposed by Brandenburg; requiring about 40 minutes to complete a determination.

A few months ago the writer, in an effort to find a still quicker method, experimented with a large number of accelerators with the result that a method was developed which requires only from five to ten minutes to complete a determination.

Procedure

The regular ammonium acetate solution as recommended by Lerch and Bogue is used for titrating. Instead of the regular 5 to 1 alcohol-glycerol solution a 2 to 1 mixture is used as this concentration dissolves lime more rapidly. The 2 to 1 mixture does not give appreciably higher results than the 5 to 1. Sixty c.c. of the solution are used with one gram of clinker or cement.

The regular procedure is used in standardizing the ammonium acetate solution and in neutralizing the alcohol-glycerol solution.

The accelerator used in this method is anhydrous strontium nitrate. Various weights were tried and it was found that two grams was the optimum amount to use for best results. The use of more than two grams failed to shorten the boiling time.

When standardizing the ammonium acetate solution two grams of the strontium nitrate should be added to the alcohol-glycerol solution in order that any lack of neutrality in the accelerator will be taken into account. It has not been found necessary to use glass beads in the boiling solution as there is no tendency to lump.

Instead of titrating the hot solution every 20 minutes as in the regular method, the solution should be titrated every five minutes. Ordinarily only one titration is required, but at times it is necessary to titrate twice. The solution should be boiled an extra five minutes in order to be sure that the reaction is complete. It is advisable to use a water cooled condenser so that no alcohol will be evaporated.

This method has been used in our laboratory for several months with very satisfactory results. It is my belief a very rapid method may be really more accurate than a slow one due to the fact that the end point is easily found and the results are easily reproducible even by an inexperienced man.

F. W. WAIT LIME CO., Glens Falls, N. Y., has filed a certificate of voluntary dissolution with the secretary of state. The company originally had a capital of $50,000.

Estimation of Phase Composition of Cement Clinker

Part 4

Type A compositions, in which C_4AF is the disappearing phase, are defined as follows: With C_4AF absent, the three phases C_3S, C_2S, and C_3A remain, indicating that as the temperature is raised above 1338 deg. C, the liquid changes in composition along the quintuple line which includes all liquids capable of existing in equilibrum with the three solid phases, that is, the quintuple line T_2E. This is stated briefly by saying that the liquid leaves T_2 to follow T_2E.

Type B compositions, in which C_3A is the disappearing phase. In this case, the liquid leaves T_2 to follow T_2W.

Type C compositions, in which C_2S is the disappearing phase. These include, among others, all portland cement compositions exceeding the technical lime limit. In this case, the liquid leaves T_2 to follow T_2T_1.

There are instances in which two phases disappear at 1338 deg. C. The liquid then leaves T_2 to follow a surface between primary phase volumes. For example, if C_3A and C_4AF disappear, the liquid leaves T_2 to follow the C_3S-C_2S surface, that is, the surface $KLWT_2E$.

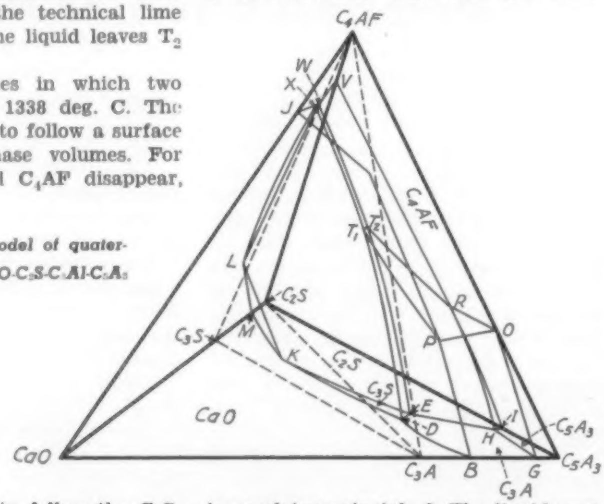


Fig. 10—Space model of quaternary system CaO-C_2S-C_4AF-C_5A_3

Fusion with Liquid on Quintuple Line T_2E (Type A Compositions)

As the temperature of a type A composition is increased above 1338 deg. C., the liquid follows T_2E, as previously shown. The liquid will not follow this line to E, but will leave the line to follow either the C_3S-C_2S or C_3S-C_3A surface (the boundary surfaces $KLWT_2E$ and DET_2T_1 respectively in Fig. 10). The conditions which determine the point at which the liquid leaves T_2E, and the surface which it then follows are found by applying principle 3. The liquid may pass from T_2E to the C_3S-C_2S surface when the C_3A/C_4AF ratio in the liquid is identical with that in the mixture under consideration. This is equivalent to stating that the A/F ratio in the mixture and liquid are identical. On the other hand, the liquid may pass from T_2E to the C_3S-C_3A surface when the C_2S/C_4AF ratio in mixture and liquid are identical.

As the liquid passes from T_2 toward E, the two conditions mentioned are not usually met simultaneously. The C_3A/C_4AF ratio of mixture and liquid may become identical before a point is reached at which the C_2S/C_4AF ratios become identical, or vice versa. Neither of these ratios involve C_3S, and it is therefore possible to consider the problem graphically, by projecting all compositions from the C_3S point to the C_2S-C_3A-C_4AF plane, by the method described in the discussion of Fig. 5. (See ROCK PRODUCTS, October, 1938, p. 47.) That is, the percentages of C_2S, C_3A and C_4AF, in any composition to be projected, are calculated to a 100 per cent basis. The composition so obtained locates the point of projection in the triangle C_2S-C_3A-C_4AF, as shown in Fig. 11.

The curve T_2E is a curve in space, within the space model in Fig. 10. To project this curve, as shown in Fig. 11, equations were derived for a smooth curve passing through T_2 and E, and passing as nearly as possible through intermediate points given by Lea* for that curve. Intermediate points on the curve, obtained by means of the equations, were projected in Fig. 11, in sufficient number to locate the curve. The projections of T_2 and E are designated as $(T_2)_p$ and E_p, the subscript $_p$ indicating that they represent projections of points not in the C_2S-C_3A-C_4AF plane.

In type A composition, C_4AF is the

* Private communication from F. M. Lea to R. H. Bogue. Points on the curve T_2W, discussed later, are from the same source.

Fig. 11—Diagram showing division of type A compositions into two classes with reference to surface followed from T_2E

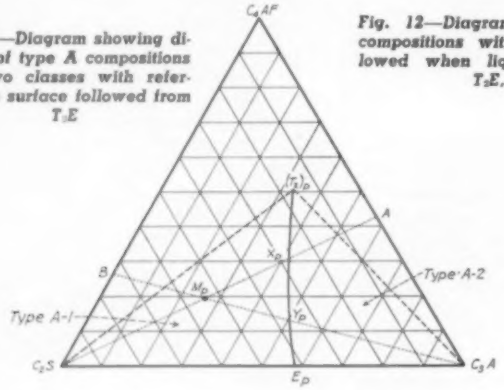
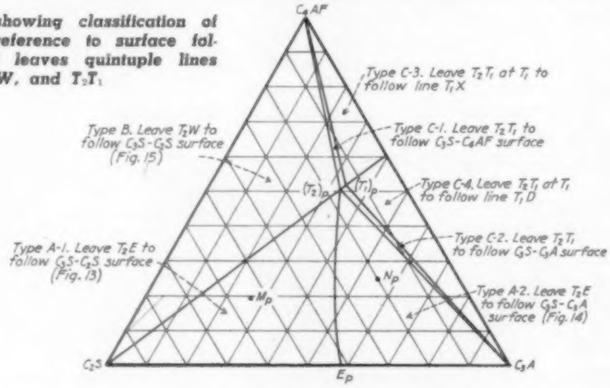


Fig. 12—Diagram showing classification of compositions with reference to surface followed when liquid leaves quintuple lines T_2E, T_2W, and T_2T_1



In the System 3CaO. SiO₂-2CaO. SiO₂-3CaO. Al₂O₃ -4CaO. Al₂O₃. Fe₂O₃ at Clinkering Temperatures

By L. A. DAHL

Research Chemist, Portland Cement Association, Chicago, Ill.

absent phase at the temperature of liquid formation, while C_3S, C_2S, C_3A and liquid T_2 are present. The triangle C_2S-$(T_2)_p$-C_3A, Fig. 11, therefore includes the projections of all type A compositions.

The condition which determines the point at which the liquid leaves T_2E, and the surface which it follows, may be illustrated by considering composition M, 54% C_3S, 25% C_2S, 12% C_3A, 9% C_4AF. The sum of the C_2S, C_3A and C_4AF in this composition is 46 per cent. The percentages of these three compounds are converted to a 100-per cent basis by dividing each percentage by 0.46, obtaining the projected composition, 54.3% C_2S, 26.1% C_3A, 19.6% C_4AF. This composition is located in Fig. 11 at the point M_p, which is the projection of M in the C_2S-C_3A-C_4AF plane. The projections of all compositions with a C_3A/C_4AF ratio identical with that of M are on the line C_2S-M_p extended to the point A. Liquid X, projected at X_p, therefore has the same C_3A/C_4AF ratio as M. Similarly, by drawing C_3A-B through M_p, it is found that the liquid Y, projected at Y_p, has the same C_2S/C_4AF ratio as M. As the liquid passes from T_2 along T_2E, it arrives at X, at which point the C_3A/C_4AF ratios of mixture M and the liquid are identical. At that point it leaves T_2E to follow the C_3S-C_2S surface (KLWT$_2$E, Fig. 10), and consequently does not arrive at Y. On the C_3C-C_2S surface it follows a curve,' all points of which have the same C_3A/C_4AF ratio.

The composition M has been used to illustrate a condition which exists in the case of all compositions which project into the region C_2S-$(T_2)_p$-E_p, Fig. 11. In all mixtures which project into this region, the C_3A/C_4AF ratio of the liquid becomes equal to that of the mixture before the C_2S/C_4AF ratios of mixture and liquid become identical. The liquid consequently leaves T_2E to follow the C_3S-C_2S surface. A similar study of compositions which project into the region E_p-$(T_2)_p$-C_3A shows that in all such mixtures the C_2S/C_4AF ratios of mixture and liquid become identical first, and the liquid consequently leaves T_2E to follow the C_3S-C_3A surface. Type A compositions may therefore be considered to be in two classes, A-1 and A-2, with respect to the surface which the liquid follows upon leaving T_2E, and the ratio which governs the point at which they leave.

The procedure which has just been described has been followed in classifying compositions in the tetrahedron C_3S-C_2S-C_3A-C_4AF with reference to the surface followed by the liquid upon leaving T_2E, T_2W and T_2T_1, as shown in Fig. 12. Since the projection of the quintuple line T_2W, if drawn, would lie outside of the triangle C_2S-$(T_2)_p$-C_4AF, type B compositions are not divided into two classes, as was found with type A. In all type B compositions, the liquid leaves T_2W to follow the C_3S-C_2S surface.

The areas for type C-1 and C-2 in Fig. 12 are extremely narrow, since liquids T_1 and T_2 are nearly identical in composition. A slight shift in the positions of T_1 and T_2, within the errors of chemical analysis, could change the classification of all compositions of these types. The areas are shown merely for the sake of recognizing that these types must exist. It is not necessary, however, to discuss them in detail.

In compositions of type C-3 and C-4, the liquid may leave T_2T_1 at T_1 to follow one of the quintuple lines T_1X, T_1D or T_1P. However, those in which the liquid follows T_1P have a lower potential C_3S + C_2S than is found in portland cement. Only those following T_1X and T_1D are considered in Fig. 12. Compositions in the triangle C_4AF-$(T_1)_p$-C_3A will be considered in greater detail later.

Fig. 12 may be used to determine whether any given composition is of type A, B or C, and also to determine the surface which the liquid follows when it leaves T_2E, T_2W or T_1T_2. The composition of the liquid when it leaves any one of these lines cannot be determined from the figure, except with reference to the relative proportions of C_2S, C_3A and C_4AF. To obtain the composition of the liquid phase in terms of

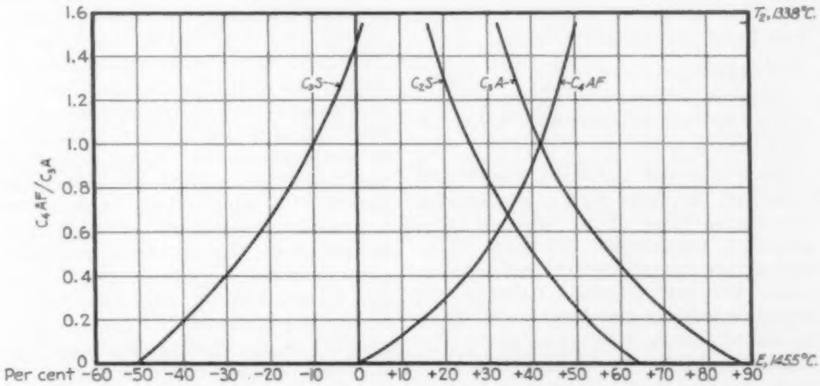


Fig. 13—Type A-1. Composition of liquid when leaving T_2E to follow C_3S-C_2S surface

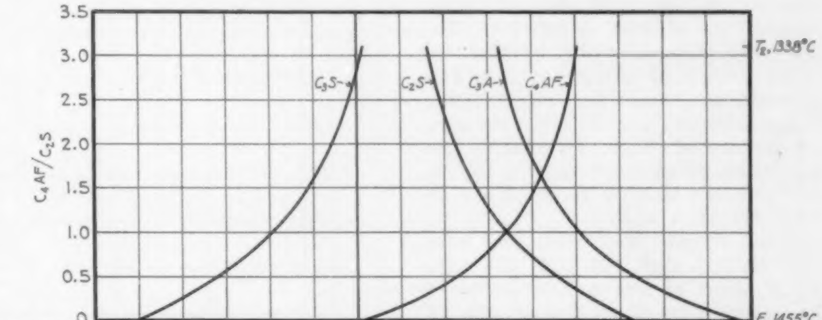


Fig. 14—Type A-2. Composition of liquid when leaving T_2E to follow C_3S-C_3A surface

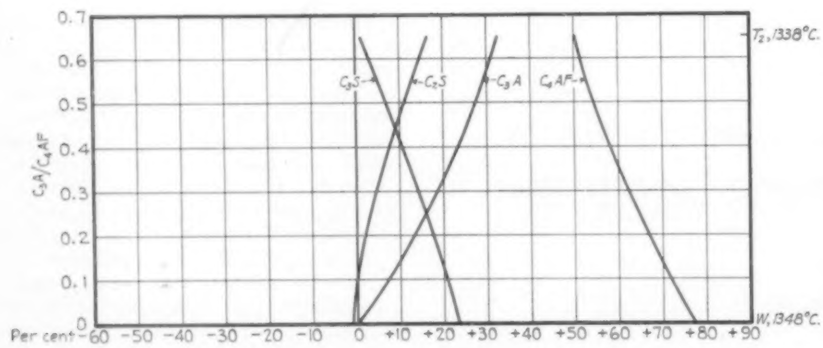


Fig. 15—Type B. Composition of liquid when leaving T_2W to follow C_3S-C_2S surface

the four compounds, another form of diagram is required. References to other figures in Fig. 12 designate the figure to be used in obtaining the composition of the liquid when it leaves the line T_2E or T_2W.

Fig. 13 and 14 give the potential percentages of C_3S, C_2S, C_3A and C_4AF at all points on the line T_2E, as obtained from the equations for T_2E, previously mentioned. A straight-edge, placed in a horizontal position across either figure, will indicate, at its intersections with the curves, the potential percentages of the compounds in a liquid on T_2E. Successive compositions of the liquid, as it follows T_2E during fusion, are obtained by moving the straight-edge downward from the highest points on the curves, which represent the composition of T_2.

Since the liquid does not follow T_2E to E, but leaves T_2E when the C_3A/C_4AF or C_2S/C_4AF ratio becomes the same as that of the mixture, these ratios, or their reciprocals, must be indicated at the sides of the figures. Both ratios could be shown in one figure, but to obtain a uniform scale for both ratios, Fig. 13 is drawn for use with compositions of type A-1, and Fig. 14 for type A-2.

The potential C_4AF in composition E is zero. The C_3A/C_4AF and C_2S/C_4AF ratios consequently become extremely large as the point E is approached. On that account, the reciprocals of these ratios are used in Fig. 13 and 14.

Fig. 13 and 14 are used in the same manner in the estimation of phase composition of type A mixtures. The first step is to determine whether the composition is of type A-1 or A-2. This is done by calculating the projected composition, as was done in the case of mixture M. Then, by locating the projected composition in Fig. 12, it will be found whether the mixture is of type A-1 or A-2.

It has already been found that mixture M, 54% C_3S, 25% C_2S, 12% C_3A, 9% C_4AF, is of type A-1, as indicated by its projection M_p in Fig. 12. Fig. 13 is therefore the one to be used in estimating the phase composition of this mixture when the liquid leaves T_2E to follow the C_3S-C_2S surface. C_3A and C_4AF are absent, and the C_4AF/C_3A ratio is therefore identical in mixture and liquid. The C_4AF/C_3A ratio in M is 9/12, or 0.75. From Fig. 13 it is found that the liquid with this ratio has the composition, -17% C_3S, 32% C_2S, 48.5% C_3A, 36.5% C_4AF. The equations for calculating phase composition may be set up as follows:

$$
\begin{aligned}
(C_3S)_e &= 54 + 17\ m \\
(C_2S)_e &= 25 - 32\ m \\
(C_3A)_e &= 12 - 48.5\,m \\
(C_4AF)_e &= 9 - 36.5\,m
\end{aligned}
$$

Since C_3A and C_4AF are absent, the equations for these phases should give the lowest value of m. However, the potential percentages of these compounds are not exactly in the required ratio. The best procedure is to apply principle 2 instead of principle 1. That is, $m = (12 + 9)/(48.5 + 36.5 = 21/85 = 0.247$. The phase composition of M is then 58.2% C_3S, 17.1% C_2S, 24.7% liquid.

Fig. 14 and 15 are used in the same manner as Fig. 13 for compositions in the regions to which they apply. The particular figure to be used may be found by locating the projected composition in Fig. 12 and applying the figure referred to in the region in which it lies.

Phase Composition at 1400° (Type A-1 and B)

According to principle 3, the relative proportions of disappearing phases in mixture and liquid must be identical. It follows, then, that a liquid on the C_3S-C_2S surface must have the same C_3A/C_4AF ratio as the mixture of which it is a part. As a liquid arrives at the C_3S-C_2S surface from T_2E or T_2W, and as it follows that surface in the course of fusion, its path on the surface must be such as to maintain the same C_3A/C_4AF as in the mixture. Thus it is not free to follow any path, but must follow a particular path on the surface, this path being determined by the C_3A/C_4AF ratio in the mixture.

A diagram capable of being used for estimating the composition of the liquid in any mixture of type A-1 and B at any temperature at which the liquid is on the C_3S-C_2S surface would be in the form of a projection of the boundaries of the C_3S-C_2S surface from the C_3S point to the C_2S-C_3A-C_4AF plane. This diagram should show projections of isotherms on the C_3S-C_2S surface, and the projections of intersections of this surface with planes representing successive percentages of C_3S. This treatment is difficult, because projections of different portions of the C_3S-C_2S surface overlap. The data for the quaternary system have not yet been analyzed to an extent sufficient to permit such treatment. At present, it is sufficient to consider the composition of the liquid at two particular temperatures, 1400 deg. C. and 1450 deg. C.

Compositions of liquids on the 1400 deg. C. isotherm on the C_3S-C_2S surface

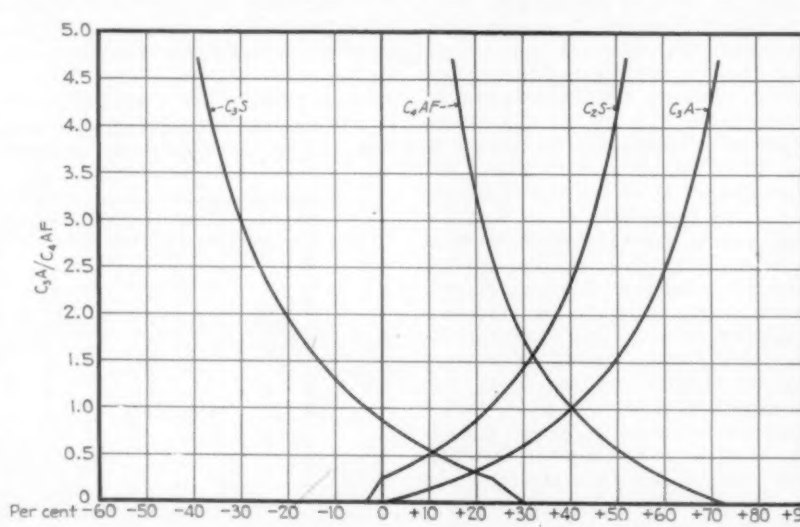


Fig. 16—Diagram for determining composition phase at 1400° C. in type A-1 and B compositions

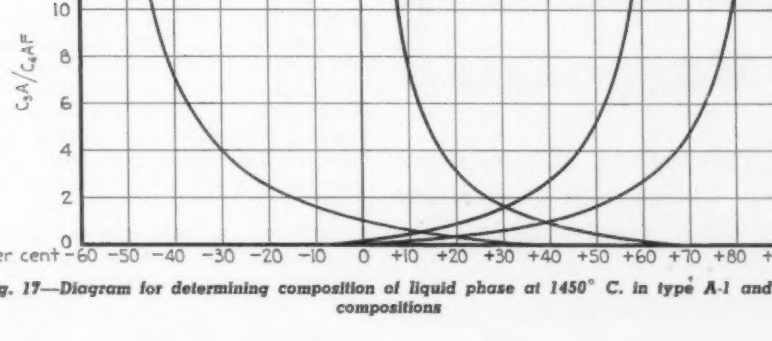


Fig. 17—Diagram for determining composition of liquid phase at 1450° C. in type A-1 and B compositions

are shown in Fig. 16, which is based upon Table 3 of Lea and Parker's paper.[3] This table is given below, with the last composition corrected in accordance with a private communication from F. M. Lea to R. H. Bogue.

TABLE 3—COMPOSITION OF LIQUIDS ON THE C_3S-C_2S SURFACE AT 1400°C.

Al_2O_3/ Fe_2O_3	CaO	Al_2O_3	SiO_2	Fe_2O_3
6.06	56.6	30.3	8.0	5.0
2.62	56.4	26.2	7.4	10.0
0.94	55.1	18.8	6.1	20.0
0.64	53.9	15.3	6.8	24.0

Fig. 16 is obtained from the equations of a smooth curve passing through the first three compositions in Table 3, and those of a straight line passing through the third and fourth. To estimate the potential composition of the liquid in any mixture of type A-1 or B at 1400 deg. C., the C_3A/C_4AF ratio of the mixture is located in the scale at the left. A horizontal line from that point passes through the potential percentage of C_3S, C_2S, etc., in the liquid.

In Fig. 13-15, compositions on the graph represent successive compositions of the liquid as it follows T_2E or T_2W. That is, each of these figures represents the course of change in liquid composition as one of these paths is followed. It should be observed that Fig. 16 does not have the same significance, since the liquid does not follow the 1400 deg. C. isotherm, but arrives at it at a particular point. The method of moving a straight-edge downward to obtain successive liquid compositions, described in connection with Fig. 13-15, consequently does not apply to Fig. 16, or to Fig. 17 and 17b, about to be discussed.

To illustrate the application of Fig. 16 to a particular mixture, the phase composition of mixture M, 54% C_3S, 25% C_2S, 12% C_3A, 9% C_4AF at 1400 deg. C., will be considered. The C_3A/C_4AF ratio of this mixture is 1.33. Referring to Fig. 16, it is found that for this ratio the liquid phase at equilibrium at 1400 deg. C. has the composition, -10.5% C_3S, 28.5% C_2S, 47% C_3A, 35% C_4AF. Equations for the phase composition at 1400° may then be written as follows:

$$C_3S = 54 + 10.5\,m$$
$$C_2S = 25 - 28.5\,m$$
$$C_3A = 12 - 47\,m$$
$$C_4AF = 9 - 35\,m$$

Applying principle 3, the value of m is $(12+9)/(47+35)$, or 0.256. Substituting in the equations, the phase composition is found to be 56.7% C_3S, 17.7% C_2S, 25.6% liquid.

Phase Composition at 1450° (Types A-1 and B)

The phase composition of a mixture of Type A-1 or B at 1450 deg. C. is estimated in the same manner as at 1400 deg. C., using Fig. 17 instead of Fig. 16. This figure is based upon Table 4 of Lea and Parker's paper.[3] The curves in the lower portion of Fig. 17 are crowded and, furthermore, have little slope. Fig. 17a represents the portion in which the C_3A/C_4AF ratio is 2.0 or less, drawn to a more convenient scale. This figure should be used when the C_3A/C_4AF ratio is less than 2.0.

Special Cases. As the liquid follows a constant C_3A/C_4AF curve on the C_3S/C_2S surface, it is approaching a composition in which the relative proportions of C_2S, C_3A and C_4AF are the same as in the mixture under consideration. If this condition is met at some point before a temperature of 1450 deg. C. is attained, the liquid will leave the C_3S-C_2S surface at that point without arriving at the 1450 deg. C. isotherm. The liquid will follow a straight line in the C_3S primary phase volume directly toward the C_3S point. Since the C_3S primary phase volume is narrow, this path will usually be followed only a short distance to the CaO-C_3S surface, which will then be followed along a constant C_3A/C_4AF curve. The same considerations apply to the 1400 deg. C. isotherm, although instances of this kind will be encountered less frequently.

The cases in which the liquid composition leaves the C_3S-C_2S surface before a particular isotherm is reached may be recognized by the fact that in the calculation of phase composition a negative percentage of C_2S is obtained. For example, if the phase composition at 1450 deg. C. of a mixture of the composition 64.7% C_3S, 5.3% C_2S, 8.8% C_3A, 21.2% C_4AF is estimated by applying Fig. 17a, it is found to be 57.5% C_3S, -2.3% C_2S, 44.8% liquid. The negative value for C_2S indicates that the computation is incorrect, because the liquid is not on the C_3S-C_2S surface at 1450 deg. C., as assumed in applying Fig. 17a, but that it has passed from that surface into the C_3S primary phase volume at some lower temperature.

* The symbols A, B, C, and D, represent potential percentages of C_3S, C_2S, C_3A and C_4AF, respectively, in any mixture (or clinker) under consideration.

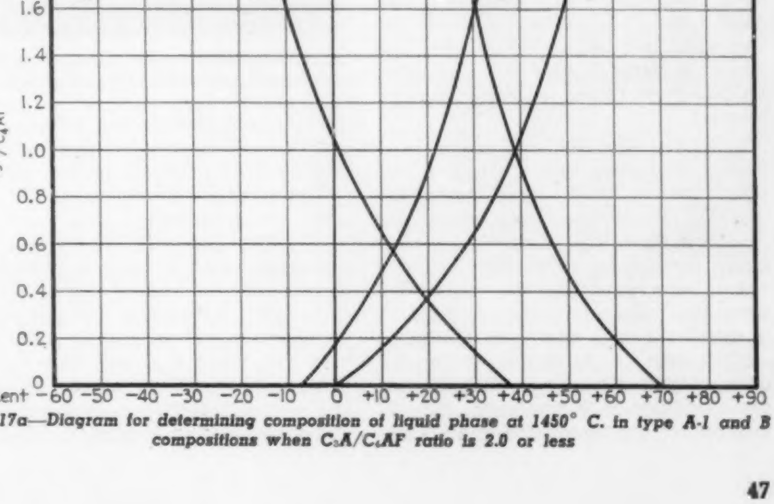


Fig. 17a—Diagram for determining composition of liquid phase at 1450° C. in type A-1 and B compositions when C_3A/C_4AF ratio is 2.0 or less

Collectively Meet Demands for Collective Bargaining

Rock, Sand and Gravel Producers Association of Northern California Contracts for All Its Members

By NATHAN C. ROCKWOOD

Since the keystone of our New Deal government is *collectivism*, and since if we are to continue to do business under this administration, we must adjust ourselves to its exactions, it seems logical that producers and manufacturers are entitled not only to act collectively, but in duty bound to do so—to be in harmony with our present government. Indeed, the NRA was an attempt to compel industry to act collectively; and there is very good reason to believe that the administration's fondest hope is to restore piece-meal as much of NRA as possible.

As every one knows, the San Francisco Bay region of California has long been one of the most powerful strongholds of union labor; so every one in business there has had considerable experience in dealing with union labor. Moreover, they have long accepted unionism not merely as a necessary business component, but as having real merit when conducted in the genuine interests of labor.

When the Federal labor relations act (the Wagner act) went into effect, the rock, sand and gravel producers of the San Francisco Bay district were immediately confronted with a unionization problem in a big way. Of course, most producers had long employed union shovel operators, truckers and teamsters and other trades, but the plants in general were not completely organized, or closed to non-union employes.

It seemed best to these producers to discuss and solve this problem collectively through their Rock, Sand and Gravel Producers Association of Northern California. Accordingly, after many conferences with employes and union representatives the association drew up a contract between itself as party of the first part, and the seven trade unions, as parties of the second part, which takes care of all labor disputes or misunderstandings for all members of the association and all employes of the members in a single, simple agreement. This agreement was signed July 16, 1937, and was renewed July 16, 1938, so what we are describing is not an experiment but something that experience has proved practicable.

Essential Features Of Agreement

The wording of the agreement is so simple and direct that we wonder if it was not drafted by a layman, rather than a lawyer. Very probably that is one reason why it has served so well.

Anson S. Blake, president, Rock Sand & Gravel Producers' Association of Northern California

One can not blame a union representative for not signing something it takes a Philadelphia lawyer to interpret.

The principal provisions of the contract are as follows:

"(1) That the party of the first part represents that it is duly authorized to represent the various firms, partnerships and individuals comprising its membership and to bargain collectively with the employes of each such component member with reference to wages and working conditions, in those plants of its membership located in what are known as Divisions 1 and 2 of the party of the first part [here follows a list of 11 counties].

"(2) That the parties of the second part represent that the employes of the members of the party of the first part are members of the respective unions hereinabove designated and that such unions are authorized by their said members to bargain collectively with the employers of such members with reference to wages and working conditions.

"(3) That the parties hereto hereby acknowledge the truth of the statements hereinabove recited.

"(4) [Relates to time the agreement becomes effective—Editor.]

"(5) The employer agrees to employ only members in good standing of the unions in their respective crafts as hereinafter defined.

"(6) The employer may, if he is unable to secure the services of a member of the union, employ other labor temporarily, but in such event he must immediately report in writing the fact of such employment to the nearest labor union having jurisdiction of that craft. Such employment may not exceed the period of one week. In the event such employe shall become a member of the union having jurisdiction, he may continue working, otherwise the employer must immediately endeavor to replace him with a union man.

"(7) No employe shall be permitted to work longer than eight hours in any one day nor more than forty-four hours in any one week for straight time. All overtime and all work done on Sundays or the following Building Trades Holidays: New Year's Day, Decoration Day, Fourth of July, Labor Day, Admission Day, Thanksgiving Day and Christmas shall be at the rate of time and one-half. It is agreed that no work shall be performed on Labor Day except for protection of life or property and then only by permission of the craft involved. Whenever any of the above holidays shall fall on Sunday, the Monday immediately following shall be deemed to be such holiday.

"(8) Each employer shall establish regular working hours so that each shift shall commence work daily at a definite, designated time. Such working hours may be changed from time to time whenever a legitimate reason therefor shall exist, but shall not needlessly be changed.

"(9) All time shall be reckoned by the day or half day except overtime, which shall be reckoned by the hour or half-hour.

"(10) Any employe ordered to report for work by an employer and not being put to work shall receive an amount

equal to two hours' pay at rate applying on job.

"(11) Notwithstanding the rates of pay prescribed for the various classifications in the hereto attached schedule any employe may be permitted to work during any given day on different jobs at the rates prescribed for that type of work without becoming a member of the union having jurisdiction of that particular craft, provided that he is a member in good standing of one of the crafts parties to this agreement.

"(12) The party of the first part agrees to pay on new construction work the existing wage scales as established by the Building Trades Council in whose jurisdiction the new work is to be done.

"(13) There is hereto attached a schedule showing the minimum wages which shall be paid by the employer to his employes in various respective occupations; provided, however, that in no case shall any employe receive a sum lesser than 65c per hour.

"(14) Any dispute concerning the interpretation of this agreement shall be submitted to the executive committee of the Association and the respective union in which such dispute arises for settlement.

"(15) In the event they are unable to reach an agreement, they shall use every effort possible to do so by arbitration, the executive committee to name one arbitrator, the union involved, another, and the two to choose a third. During the pendency of such negotiations no cessation of work shall take place.

"(16) The employer agrees to furnish to the unions a list of its employes and to revise the same every thirty days.

"(17) The daily and weekly working hours as set forth in this agreement shall remain in full force and effect during the life thereof, or until within such time as a shorter working day or week shall be prescribed by law, and shall then be changed only with respect to such working hours to conform to such law.

"(18) This agreement shall be effective as to wages . . . [here is inserted the date, etc.—Editor.]

"(19) The schedule or schedules hereto attached shall be deemed to be a part of this agreement.

"(20) It is specifically understood and agreed by and between the parties to this agreement that no existing wage scale shall be reduced, any or all of the provisions notwithstanding."

That's all; this agreement was signed by the president and secretary of the Rock, Sand and Gravel Producers Association of Northern California, and by the heads of the (1) Steam Shovel Operators' Local Union; (2) International Brotherhood of Teamsters, Chauffeurs, Stablemen and Helpers; (3) Operating Engineers' Local Union; (4) International Association of Machinists; (5) International Brotherhood of Blacksmiths, Drop Forgers and Helpers; (6) International Brotherhood of Electrical Workers; (7) International Hod Carriers, Building and Common Laborers Union of America.

W. W. Dennis, secretary, Rock, Sand & Gravel Producers' Association of Northern California

Then follow as a part of the agreement a pay schedule for each craft, together with such provisions as the following in the case of steam shovel operators: "Operator, foreman and watchman shall constitute crew of steam driven machines; and operator and apprentice shall constitute crew of gas, Diesel or electrically driven machine." Each of these sub-agreements was signed by the head of the union involved.

Operating Experience

In practice the agreement has worked out, apparently, to the satisfaction of all concerned. The executive secretary of the association, W. W. Dennis, has had many years' experience in business related to building and is thoroughly familiar with problems arising from dealing with union building trades labor. By knowing and understanding not only the problems, but by knowing and understanding the union officials themselves, he has been able to meet every situation thus far. By keeping a fair- and open-minded attitude and by giving as well as taking on behalf of his association members, Mr. Dennis has won the respect as well as the good-will of labor union leaders. He has come to be looked upon as a referee for both sides to every dispute. Such disputes are often settled without the actual individual employer entering the picture at all.

The president of the Rock, Sand and Gravel Association of Northern California is Anson S. Blake, president of Blake Bros. Co., quarry operators and crushed stone producers, San Francisco. Most mineral aggregate producers will remember Mr. Blake because of the very able and conscientious service he rendered the industry during NRA days. Few men in prominent places in industry are more innately fair-minded and kindly disposed than is he. We are sure that the straight-forward agreement, fair and impartially worded as it is, must have been to some extent drafted by Mr. Blake. Mr. Blake's predecessor as president of the association, when the original agreement was made, is Charles M. Cadman, president of the Pacific Coast Aggregates, Inc. He also is well-known for his fairness and sense of justice. As a matter of fact, the San Francisco Bay producers as a whole are a remarkably forward-looking, liberal-minded group.

JOHN SLATER SAND & GRAVEL CO., The Plains, Ohio, is a new company which recently bought out a sand and gravel plant at Logan, Ohio, and is now setting up the equipment at the new location. John Slater, the proprietor, is a retired superintendent of a coal mine. He retired to a farm where he discovered a good gravel deposit, and for the past year has been selling bank run material. However, he decided recently to install a washing plant and purchased the equipment at Logan, Ohio.

STURGEON BAY CO., Cleveland, Ohio, recently set off what is claimed to be the largest blast in a Door County quarry at its Sturgeon Bay, Wis., plant. Over 20,000 lb. of powder were used to blast down about 100,000 tons of rock. In spite of the fact that the blast involved such a large quantity of explosives, the adjacent property owners were hardly aware that it had been set off. The blast brought down a section 1100 ft. long, 24 ft. wide, and 55 ft. deep. A half-mile of fuse wire was required.

BARNES SAND & GRAVEL CO., Piketon, Ohio is building a new plant at a location one-half mile north of their present plant which will be on the Norfolk & Western Railroad. This move was made as the deposit had run out. All the equipment will be new except the Diesel engine. The new plant will have a capacity of 60 tons of sand and gravel per hour. Bins will be of wood construction. The new deposit comprises 38 acres with a small overburden.

VALLEY SAND AND GRAVEL CO., Washington, D. C., has leased The Islands, a part of the Bell Point farm in New river at Lurich, Va., presumably for development of a sand and gravel deposit.

Gas Producer Performance Tabulations Analyzed

By VICTOR J. AZBE

Consulting Engineer, St. Louis, Mo.

LIME FORUM

Mr. Azbe is a contributing and consulting Editor of ROCK PRODUCTS. He will be glad to receive inquiries from his readers, and will answer these direct or through the columns of this Forum.

In the November issue of Rock Products, a series of tabulations was published dealing with the performance of a certain specific gas producer system. However, the information also largely applied to any installation, and as it helps to create an insight into often rather puzzling conditions, it seems desirable to discuss the various tables presented in greater detail.

Table 1. Analysis and heat value of coal fired. Much could be said about this tabulation. Of course, it is very desirable to have a fuel of high heat value, but what counts more is the quantity of heat for a given amount of money; the number of B.t.u. for one cent, for example. If the heat value is low, it is in part due to excessive quantities of ash and moisture and in part due to the oxygen content of the coal. Now ash is not particularly harmful, if it is good ash, especially if producers are operated at low capacities. If coal is too low in ash, it is removed less frequently and the bed therefore tightens up, requiring a higher blast and a greater probability of blow holes. With high ash coals the bed is looser. This all depends of course upon the sort of ash, whether it is of a high or of low fusing variety.

Coals high in volatile matter and moisture generate a cooler gas because heat from the hot zone of the producer is used to evaporate the water and distill the volatile. High volatile coals will gas better and will require less blast because the blast is needed only for the fixed carbon portion of the coal. Coke will not gasify without air; it must have air while the volatile portion of the coal does not need air, but only heat to be driven off.

If high capacity is desired from the producer, coal high in volatile should be used. This, however, again depends upon the nature of the volatile matter. Some are much leaner than others having a high oxygen content.

Sulphur in coal is a factor in lime plants because that which gets into the kiln will, in considerable part, combine with lime, and that condition is most decidedly not wanted. However, sulphur in coal may be there in three different forms. It may be organic sulphur, pyritic sulphur, and in combination as sulphate. All of the organic sulphur gets into the kiln, only some of pyritic sulphur, and none of the third variety.

Feeding Lime to Gas Producer To Reduce Harmful Sulphur

The big question therefore is how much of the sulphur in the coal may be harmful to lime. The next question is how may the harmful variety be reduced. It was found in testing on a small scale that feeding lime into the producer greatly reduced sulphur in the gas. It is not known if anyone has made a thorough study of this on a large scale. Someone certainly should. The procedure should, however, be cautious because lime in the producer will reduce the ash fusing temperature and may bring on serious clinkering.

Table 2 gives the distribution of heat in the various main components of coal. Most of it is in the fixed carbon portion but this will vary from 92 percent for anthracite to only 35 percent in wood. The soot and the tar have considerable heat, but the tar is a vapor and in well designed plants where the gas is not cooled off it is not apparent because it has no chance to condense out and enters the kiln. Due to its high calcium content the tar vapor confers great luminosity to the flame and, if permitted, also a long flame characteristic. Soot is a problem, but if the producer gas is cool there will be less of it. However, there will always be more than one wants. It may be combatted to a considerable extent by arranging to separate the soot from the gas, by using fairly high gas velocities to try to keep it in suspension, and by facilities for quick blowing of flues when necessary.

Table 3 is interesting in that it gives the analysis of volatile matter. It is practically all combustible, and it has a very high heat value, practically the same as city gas from coking plants, and almost four times that of gas from complete gasification of carbon. For this reason coal fed to producers should be as constant as possible. If too much coal is fed in a short time, the gas made will be very rich due to an abnormal amount of volatile driven off in a short time. When green coal is fed on too hot a bed of coal, the same result will occur. The volatile content will flash and since the kiln may not be adjusted for the burning of the unusual quantity of abnormally rich gas, there being insufficient air to burn it, the result will be smoke.

The producer may be blown with air and steam, the two being adjusted to a saturation temperature anywhere from 110 deg. F. to 150 deg. F., depending on the clinkering tendency of the ash or carefulness of the fireman. It may also be blown with a kiln gas—an air mixture containing from 2 percent to 6 percent CO_2; the exact amount again depends upon the nature of the ash and on the fireman's efficiency.

Table 4 gives a blast mixture having 3.4 percent CO_2. In most cases this is ample. The less CO_2 there is in the gas the better it is, provided clinkering is avoided, as CO_2 or steam are both just a necessary nuisance. The avoidance of clinkering refers to large clinkers as small pebbly clinkers are desirable. The ash drawn should not be powdery but rather sort of rattly and loose. With such ash the blast needed is less and its distribution is much better.

In place of steam CO_2 was first tried in 1925 at the Marblehead Lime Co. plant at Marblehead, Ill. It was an immediate success and since that time many lime plants have changed to CO_2. To use steam whicn is costly, when ample quantities of CO_2 are available, is foolish, particularly when a special boiler and even special firemen are kept just for gas producer steam. If a proper connection to the kiln is made, almost any kiln will give a gas of around 30 percent CO_2 and since not more than 6 percent is required not much of the gas is needed. In Table 6 it is shown as 7 cu. ft. of kiln gas to 37 cu. ft. of air, but if the installation is made for double this quantity one is amply safe and provision has been made for all unusual contingencies.

This analysis of tabulations dealing with lime kiln as producer performance will be continued in a later issue.

Appraising Safety Work

Final Article of Series Discusses Organization Methods

By **A. J. R. CURTIS**

Secretary, Committee on Accident Prevention & Insurance Portland Cement Association

Many people who have been giving thoughtful attention to the prevention of industrial accidents have come to the conclusion that their plant safety meetings might be improved a great deal.

This thought applies with about equal emphasis to safety committee meetings and to departmental and plant mass meetings. Spokesmen for many industries complain of the same difficulty. No feature of safety work is more important or, in fact, so nearly indispensable as meetings devoted to analysis, planning and study of the subject. Yet when safety meetings get on the downgrade they have been allowed sometimes to go from bad to worse and finally to the point of discontinuance. In many places safety meetings seem to have lost their "punch" and their "hold". Here are some of the common indictments against them:

"Our meetings have become something of a bore" say many.

"Our meetings are disjointed and sort of a jig-saw puzzle" say others.

"Not part of a progressive, coherent series"; "Not broadly planned"; "Nearly always lacking in advance preparation"; "Defective in direction and chairmanship"; "Focusing but vaguely on the subject matter"; "Unproductive for some reason or other", and "Often a waste of time because of delays, gossip, and story telling".

The foregoing may be accepted as a reasonably good collection of the faults that so often obtain with safety meetings. Yet meetings are not inherently worthless because as now conducted they are lacking in effectiveness; on the contrary there is much valuable work to be done through safety meetings and, in fact, much necessary work which cannot be done in any other way.

Some Ideals for Safety Meetings

In order to make plant safety meetings fully successful they must be: intensely interesting; well planned, presenting an unbroken chain of ideas; always plainly stated and clear as to purpose and meaning; planned as part of a comprehensive and well-balanced series of meetings; well prepared and rehearsed in advance; carefully directed by an able chairman, to keep the meeting at work on the objects for which assembled, to prevent interruptions, wise cracking, story-telling and the discussion of unprofitable and extraneous subjects; to preserve decorum; open and close the meeting with promptness and handle all matters with reasonable dispatch.

If the plant safety committee expects to plan and accomplish anything, its meetings, which constitute its chief mechanism for progress, must be purposeful and effective; they are the occasions on which ideas and opinions are fused into action. Such meetings are of chief importance not as occasions but rather as they serve to vitalize the day-in and day-out safety work in the plant. In fact, most thoughtful safety leaders depreciate the value of safety meetings as such, feeling that it is the daily safety detail that really counts. So we may repeat for emphasis the statement made above: *Plant safety committee meetings are important chiefly as they serve to vitalize the day-in and day-out safety work.*

One Serious Defect

Granting then that we have found the most important reason for plant safety committee meetings, let us consider the type of meeting we have all been depending on to "revitalize day-in and day-out" safety work. Ninety-five percent at least of the time of the typical mill safety committee meeting is taken up with routine—and very little, if any, is given to planned educational activities.

The reason, then, why these meetings cannot be continued indefinitely without becoming boresome or losing their snap and vigor, should not be at all obscure. They are generally lacking in the "regenerative" element. What they lack and need most is a progressive educational function. One of the most practical methods of supplying the need is by adding to these meetings a continuing series of educational subjects. Where the plant committee is composed entirely of permanent members, time for the new function may be arranged either by (1) condensing routine and adding an educational subject at each meeting or (2) alternating between routine and educational meetings.

It is a difficult matter to reach in this way those below the rank of supervisor who are chosen to serve on committees for short periods. Any study series should be pursued continuously. But those in the plant organization who cannot easily be included in a regular study and discussion meetings, profit because of the better direction and quicker interest in safety derived from supervisors who participate. Thus the points brought out in an animated discussion of "the causes of an accident" in an educational meeting attended by the general committee group are reflected promptly in departmental safety conferences and plant mass meetings.

Routine Committee Meetings

The first step in improving plant safety meetings is to put the routine general committee meetings in order. By so doing, they can not only be made more profitable but a lot of time usually can be saved for more advantageous use; it is clear to most operating officials that educational meetings are out of the question unless they can be held without greatly increasing the time now spent for safety activities.

A well-ordered meeting is called to order by the chairman *promptly* at the hour announced. The chairman should not be late and he should not have to contend with late arrival by members. Members of the committee should not be called to the telephone or otherwise interrupted during the meeting except in emergencies. In order to prevent interruptions many plants have arranged to hold general safety committee meetings in a private room at a club or hotel.

One of the commonest reasons for low efficiency of committee meetings is lack of quiet and comfortable surroundings. A room that is dark, dirty, noisy or furnished only with benches or worn-out chairs does the company and management no credit, belittles the cause of accident prevention and works against safety acomplishment.

A good secretary is fully as important as a good chairman. He should be at his desk before the meeting is called and immediately thereafter should note the attendance. He should keep clear, concise but complete records. He must see that there is a record of every

verbal recommendation. It is his business to make sure that every recommendation is acted upon one way or another and that the person or persons who made it are notified.

Some cement plants hold meetings of their general safety committees as often as once a week, others as infrequently as once a month. Some hold a "regular" meeting once a month, continuing about an hour, with short weekly meetings (20 minutes) to handle matters requiring prompt attention. The latter plan is generally considered the more desirable although either may be found entirely satisfactory.

The order of business should be as follows: call to order—on time—by the chairman; recording of attendance, by the secretary; introduction of new employes and new committee members; report of the chairman or secretary; unfinished business. This should be followed by a report of the sub-committee on Accident investigation, covering accidents and near-accidents occurring since last meeting. Review facts with statements by injured, foremen and others, and make recommendations for preventing recurrence, other recommendations, and recommend appropriate action; reading and discussion of accidents reported in PCA Round Table; report of sub-committee on inspection, covering general, departmental and special inspections made since last meeting, recommendations, appropriate action; safety suggestions received from employes, read by secretary, action on each suggestion; reports of sub-committees other than above; new business; announcements; adjournment.

General Committee Structure

The following suggestions for safety committee structure may be used effectively in studying the possibilities for improving present set-up:

I. Chairman

(*A*) Chosen by appointment of plant superintendent to serve not less than 6 months, not longer than 12 months.

II. Secretary

(*A*) Chosen by appointment of plant superintendent for permanent service.

(*B*) Suggested suitable appointees: safety engineer or supervisor; chief clerk; assistant superintendent.

III. Membership

(*A*) Permanent committee members: departmental foremen, mill foremen, quarry superintendent or foreman, chief electrician, master mechanic, superintendent and assistant superintendent.

(*B*) Rotating members to serve from 3 to 6 months: six to twelve employes representing different departments, nominated by foreman and elected by permanent members.

IV. Standing Sub-Committees

(*A*) Structure: 1. Chairman—appointed by general chairman from permanent committeemen. 2. Membership—as activities dictate. Three is ideal working unit. Not more than five. 3. Personnel—except chairman to be chosen from non-members of general committee for rotating service—3 to 6 months.

(*B*) Function: programs and events; guarding machinery; safety rules; accident investigation; inside housekeeping; outside housekeeping; first aid; fire prevention; employe welfare; plant safety publicity.

Sub-Committee Organization

Every general plant safety committee in establishments employing over 25 men, should have its membership divided off into sub-committee groups of at least three members charged with responsibility for the more important divisions of safety committee work. Here are some suggestions:

(*A*) Meetings: At least monthly; chairman will prepare report for general committee.

(*B*) Activities:

1. Programs and events—to recommend programs, speakers and entertainment for safety mass meetings. To supervise details and handling.
2. Guarding machinery — the master mechanic is logical chairman. To act on recommendations for guarding equipment. Maintenance of guards.
3. Safety rules—to review rules constantly to keep them up-to-date. To recommend new rules when necessary and based on experience. To recommend methods of publicizing rules.
4. Accident investigation — to render complete reports on accidents, their causes, direct and contributing. To act independently of any other investigation. To act immediately when an accident or near accident occurs.
5. Inside housekeeping—to report on housekeeping conditions under the mill roofs. To inspect at least weekly.
6. Outside housekeeping—same as 5. All outside property.
7. First Aid—to recommend training in first aid practices. To act in emergencies.
8. Fire prevention—to report on fire hazards and make recommendations for fire prevention. To inspect fire extinguishers regularly.
9. Employe welfare—to keep in touch with sick and injured fellow employes and assist wherever possible.
10. Publicity — to furnish interesting personal items and safety material for bulletin boards, employe publications, etc. To furnish pictures and reports of interesting events for use in Accident Prevention Magazine of PCA.
11. (Other sub-committees as required by conditions.)

Educational Meetings

Adults do not relish the idea of going to school. Only an inconsiderable proportion of them will do so despite the generally acknowledged fact that old age begins when the individual stops learning or desiring to learn. There is a similarly resistant attitude toward "lessons," "course," "instruction" and other words closely associated with going to school.

So in seeking to widen the function of plant safety meetings to include features instructive to the individuals as well as purely routine, it is quite necessary to avoid, so far as possible, terms like those mentioned above and what is far more important, to avoid anything like a school room set up. Meetings for the educational advantage of the supervisor group may be called conferences and may very well follow the conference style or pattern.

It will be evident as meetings of this type go along that very little that is really new or unknown to the supervisors will be brought out, but a well handled project of this kind should help individuals to arrange and organize their information in a way that will make it more readily and completely available in stimulating original thought and passing ideas along to their respective employe groups.

The new series of subjects for supervisor conferences recently suggested by the Portland Cement Association for cement plant use follows these suggestions. The conferences are being held at intervals of two weeks. Great importance is placed on having the superintendent act as chairman. Each conference takes the form of a discussion guided by two leaders and in which all others present take part. Discussion is induced and kept on the track by means of prearranged questions and answers. Each conference outline can be covered in 45 minutes unless the discussion becomes too spirited. In case the outline discussion cannot be completed in an hour, it is preferable to adjourn and to complete consideration at a further session.

The Portland Cement Association has

built its initial series of subjects for supervisor conferences, starting with a list of excellently compiled questions and answers recently offered by W. Dean Keefer, director of industrial safety of the National Safety Council. The conference subjects referred to, and which are in use by the cement organizations during the period July 15 to December 15, 1938, are as follows:

Preventing Accident Recurrence

(1) What Are the Causes of Accidents?
There are nine primary causes of accidents. These causes are listed and discussed.

(2) How Can the Cause of an Accident Be Found?
Careful investigation of all factors relating to an accident will reveal its cause. The objective of accident investigation must be "finding the cause" rather than "fixing the blame."

(3) How Can Accidents Due to Faulty Environment Be Prevented?
Preventive measures are dependent on the cause. If faulty guarding is the cause, installation of adequate guards is the remedy. For every cause there is a parallel preventive measure.

(4) How Can Accidents Due to Faulty Human Behavior Be Prevented?
Placement, training, supervision, discipline and general safety education are all important in the development of the safe worker.

(5) Is Every Accident Due to Just One Cause?
Usually a combination of causes operates to produce an accident. These accidents should be treated just as several accidents, each due to one cause, would be. Sometimes the same accident will occur a second time from a different set of causes. It is therefore necessary to discover causes before they result in accident.

Predicting Accident Occurrence and Eliminating Potential Causes

(6) Analyzing Plant Records.
Methods of analyzing plant records are discussed. Analyses will reveal hazardous jobs, what types of accidents are most frequent and what causes are most frequent. Knowledge of these factors point the way to prevention.

(7) Organization of Plant and Personnel for Safety.
An active company policy regarding the safety organization is necessary. Rules and regulations should be readily understood and enforced uniformly. Model safety organization plans are suggested.

(8) Responsibility of Supervision and Management.
Safety work begins with management and supervision. Management's treatment of safety recommendations will determine attitude of employes toward safety.

(9) Plant Inspection.
Inspectors must be alert to detect hazards and must be thorough. Special items to check are listed. Utilization of safety inspection as a means of training safe workers is discussed.

(10) Job Analysis.
Careful analysis of a job may reveal hazards undetectable by other means. Job analysis should include study of both equipment and operating methods.

Discussion in First Conference

Following are the questions and answers which form the basis of the discussions in the first conference:

GENERAL SUBJECT: *What Are the Causes of Accidents?*

Q. Do you believe that accidents just happen?
A. Accidents do not just happen.

Q. Would it be exact to say "Accidents do not just happen, they are always caused or is this statement sometimes false?
A. The statement as given in this question is correct. ACCIDENTS ARE ALWAYS DUE TO CAUSE.

Q. Is "bad luck" a cause?
A. No. If every accident has a cause there is no luck in it. (Even if the cause is hidden, it is there nevertheless.) As far as accidents are concerned no man is unlucky. If one man seems to have more than his share of accidents there is good reason for his apparent "bad luck."

Q. If an accident were really due to luck, could you do anything practical about it?
A. No. Someone might try a clairvoyant. But, fortunately, accidents are not due to luck. Every accident has a cause.

Q. If all accidents are due to causes, how do you believe these accidents can be prevented?
A. The first step would be to discover the cause or causes.

Q. Do you agree that industrial accidents can be prevented only if we know their causes?
A. Yes. To discover the cause of the accident is absolutely essential.
(The answer might be developed in discussion by emphasizing that as long as accident causes are not eliminated, accidents will continue to occur no matter how much general safety propaganda is used.)

Q. Is there a difference between the cause of an accident and the cause of an injury?
(When a man is hit on the head by a hammer, it is customary to classify the accident as caused by a falling object. It would be accurate to say that the injury was due to a falling object; the accident was due to other causes.)
A. Yes. What we need to do is find the cause of the accident.
It may be helpful to bring out by discussion that the order of events causing an injury are:

1. The cause of the accident.
2. The accident (falling hammer).
3. The injury (caused by the falling hammer).

Q. Having found the real cause or causes of an accident, what must we then do?
A. We must find a way to prevent recurrence.

• • •

Q. Is it always correct to say that the injured person is responsible for his accident?
A. No. Nothing will prevent finding the true cause of an accident more effectively than the statement, "It was injured's own fault."
(Emphasize the idea that no one wants to get hurt. Placing blame on injured person does not find the cause.)

Q. Could absence of guards cause an accident?
A. Yes! Inadequate guards frequently cause accidents. If a man is injured because of neglect to guard a hazardous machine, the surest way to prevent recurrence of the accident is to equip the machine with a fool-proof guard.

Q. What other mechanical causes of accidents can you name?
A. Defective tools and equipment, hazardous arrangement, improper illumination and improper ventilation are all mechanical causes of accidents.

Q. What is the best term to cover all of these causes?
A. Faulty environment. The word "mechanical" suggests too strongly the idea of machines. "Environment" includes the entire physical surroundings of the employe in his workplace.

Q. Can you suggest another kind of faulty environment?
(If a man suffers an eye injury because of lack of goggles, we would say he did not have adequate protective equipment. This equipment should have been a part of his environment on the job.)
A. Yes. Improper dress or apparel.

Q. How can an accident occur even though all six causes listed so far are corrected?
A. Because of faulty human behavior. We have already mentioned that no one wants to get hurt. Yet, faulty behavior does cause accidents.

Q. Could physical defect be an accident cause?
(A man with a "game leg" is assigned to a job that calls for nimble-footedness. He is hurt because he could not move fast enough.)
A. Yes. Workers should always be assigned to jobs for which they are known to be physically and mentally capable.

Q. When an accident investigation shows that the injured man was physically fit and "safety minded," but unwittingly made a mistake, what is the probable cause?
A. Lack of training or skill.

Bring out the fact that inexperienced men require continuous supervision during their learning period, and that where this is absent, an accident is likely to recur due to ignorance of the worker.

Remember also that an experienced man in one job may be entirely unfamiliar with other jobs to which he might be transferred.

Q. Can a man be physically fit and well trained yet cause an accident?
A. Yes. He may take the wrong attitude toward safety. The only way to keep him from getting hurt again is to help him get the right outlook.

ROCK PRODUCTS PRODUCERS who have claims against the United States Government for recovery of increased costs resulting from the operations of the National Recovery Act of 1933 on contracts entered into prior to August 10, 1933, when the act became effective, should be interested in an article in a recent issue of *Engineering News-Record*. The author, John W. Gaskins, is a Washington, D. C., attorney.

He calls attention to an act passed at the last session of Congress which gives the United States Court of Claims jurisdiction to entertain suits against the United States to recover such claims. Hitherto these claims have been involved in much red tape. The statute of limitations on such claims allows only until December 25, 1938, to institute suits.

REMINGTON STONE & GRAVEL CO., Loveland, Ohio with plant at Miamiville, Ohio, is adding a reduction crusher for ¾-in. minus stone. The plant has a capacity of 1800 tons daily. Power is furnished by a National-Superior Diesel of 350 hp., direct-connected to a 240 kw. generator.

HINTS AND HELPS for Superintendents

Economizing on Wash Water

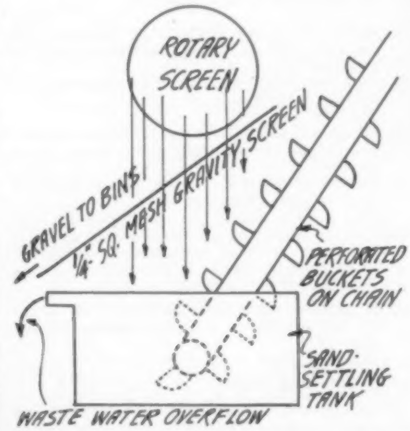
THERE ARE NUMEROUS PLANTS in the sand and gravel and stone industries where water is scarce. In the case described herewith, the water used was purchased city water, and for reasons of economy the operator did not want to use or waste any more than necessary.

The operation is the Cora Ave. plant of the Hawkeye Sand and Gravel Co., Spokane, Wash., which has a capacity of about 40 cu. yd. per hour of sand and gravel, and of this, 24 cu. yd. per hour is sand.

Above: Underneath rotary is shown inclined gravity screen which is partitioned and serves as a chute for various sizes of gravel. Below: Chain bucket elevator, with perforated buckets for removing and dewatering sand from settling box

The initial screening and washing is done in a 36-in. diameter rotary screen which has wire cloth sections 3 to 4 ft. long for separating out the various sizes of gravel. All these sizes with whatever sand there is with them drop below to an inclined gravity screen with ¼-in. square mesh cloth. This screen is partitioned and acts as a chute for the various sizes of gravel to their respective bins.

The sand of course drops through, to a settling tank below from which it is recovered by a chain-bucket elevator (Link-Belt with 8- x 12-in. perforated buckets) and placed in a sand bin. With 65 gal. of fresh water per minute a satisfactory washing job is accomplished in this particular instance. The material in the bank, however, is fairly clean and had been used without washing prior to this recent installation.



Arrangement of screens, sand settling tank, and elevator designed to conserve water

Screen Brooms Prevent Blinding

ROLLERS AND BROOMS for keeping rotary or trunnion screens from blinding have been described in these pages before, but the installation illustrated herewith appears to be one of the most effective. These are ordinary street-sweepers' brooms nailed to stiff members so that they actually bear down on the screen surface. Wear is evidently taken care of by knocking the holding arm down closer to the screen.

Street sweepers' type of broom applied to screen prevents "blinding"

This device was found at the Cora Ave. plant of the Hawkeye Sand and Gravel Co., Spokane, Wash.

New Type Bin Gates

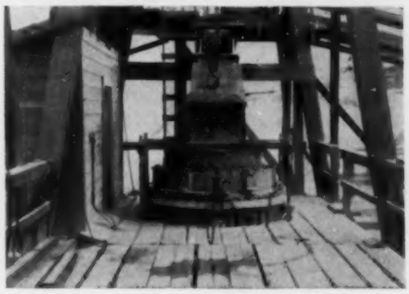
AT THE NEW READY-MIXED CONCRETE plant of the Pacific Coast Aggregates, Inc., San Francisco, Calif., a type of bin gate is used which is unusual, and seems to have several advantages. It is said to be a European design. The gates in this particular case were made by the Link-Belt Co. and have ball-bearings to insure that they will not bind. Their construction is shown in two of the accompanying illustrations.

The third illustration shows a similar

Type of bin gate used at the Basalite plant of Basalt Rock Co., Inc., Napa, Calif.





Views of sand and gravel plant of the Glacier Gravel Co., Steilacoom, Wash. Top row, from left to right: Hoist house on skids; scraper bucket; conveyor from pit to plant. Bottom row, left to right: Structure housing new crusher and scalping screen; other side of crushing unit showing conveyor taking throughs back to the main stream beyond the scalping screen; new cone crusher

gate being used at the Basalt Rock Co.'s new concrete products plant at Napa, Calif. These gates were made locally and have only a simple pin bearing.

The gates are of the sliding cut-off type, operating in a horizontal plane. The gate itself has no support except the pin bearing, and is therefore subjected to some kind of a cantilever loading from the column of material over it. That is the reason for the reinforcing ribs on the under side. Actually the load is unknown, for it is not a column of material extending up through the bin, but merely a small cone of material over which the rest of the material arches. However, in cutting off the flow of material with this type of gate it may be subjected to considerable stress.

Both users express themselves as much pleased with the operation of these gates, and they have the obvious advantage of requiring very little headroom.


Above: Bin gate, requiring little head room, used at Colina ready-mixed concrete plant, Pacific Coast Aggregates, Inc., San Francisco, Calif. Below: Close-up of bin gate showing welded rib construction

Crushing Plant Added Without Complications

THE GLACIER GRAVEL Co., Steilacoom, Wash., recently added a crushing unit without disturbing the continuity and simplicity of operation which have made this plant an outstanding low cost producer. Descriptions of the plant have been published a number of times, so only an outline is necessary here to show how the new crushing plant fits into the flowsheet.

The high bank is excavated by a 150-hp. Washington Iron Works hoist, in a structure on skids, and a 4-cu. yd. Bagley scraper bucket, illustrated above. Wood-plank lined tunnels in which field conveyor belts are housed lead to the face of the pit and the bucket discharges to openings and hoppers which feed the belt below. Originally these field belts led directly to the main conveyor belt to the washing and screening plant.

To meet the demand for crushed material, small boulders originally discarded could be crushed. This was provided for by putting a scalping screen in the line of travel of the material from pit to plant. This 4- x 8-ft. Stephens-Adamson vibrating scalping screen takes out boulders and pebbles over 3 in. The largest boulders are rejected over a gravity grizzley to a tram car and are wasted. The others are taken out on a conveyor belt at right angles to the stream of materials going to the plant and fed to a 4-ft. Symons cone crusher, the output of which returns to the main stream beyond the scalping screen.

In spite of these two extra units, the operation is just about as automatic as it was before. That the operation is really simple was proved not long ago

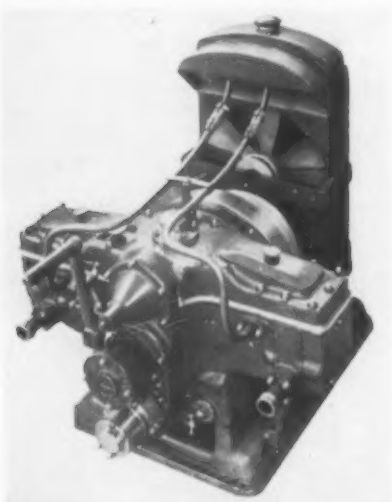
To the left, Frank Heffernan, plant superintendent

when a strike caused the plant to be without employes and picketed. Frank Heffernan and his brother, J. T., Jr., sons of the proprietor, operated the plant themselves, alone. Frank had some encounters with pickets, but it would take three or four pretty tough "eggs" to have the courage to molest him, one would guess. Anyhow, they showed a group of insurgent workmen that they were not so darned important to the operation of the plant as they thought, for it produced and shipped its quota just the same without them.

NEW MACHINERY AND EQUIPMENT

"Pancake Type" Diesel

NORTHILL CO., INC., Los Angeles, Calif., has acquired manufacturing and sales rights for the Covic Diesel engine. Cylinders on the Covic Diesel are horizontally opposed, of the "pancake type," which permits installation, it is claimed, in places formerly impossible for Diesel engines. This engine was originally developed in England and thousands are in use throughout the world, for marine, stationary and automotive power



Diesel engine designed to occupy small space

Where conventional Diesel engines have been two to three times the weight of gasoline engines of comparable power, the Covic Diesel, it is said, has the same relation of weight to power as present gasoline truck engines. The weight of the basic Covic engine is 280 lb., including flywheel. This is the result of patented principles and design, plus the use of specially developed metal alloys.

Convertible Shovel Has Electrically Welded Base

SPEEDER MACHINERY CORP., Cedar Rapids, Iowa, has brought out a ¾-yd. convertible model "LS-80" shovel. This 19-ton machine has positive steering, and a traction lock controlled from the operator's seat.

It has two speeds in traction and either 20 in. or 24 in. lug-driven tracks or "Caterpillar" tractor tracks are available. All upper machinery is behind an

Shovel with electrically-welded alloy steel base

oversized center pin which cares for horizontal stresses. Four hook rollers riding on a large diameter turntable provide for vertical stresses. There are two independently mounted power drums and a positive self-locking, worm-geared, two-speed boom hoist. This unit is powered by an 80 hp. gasoline or diesel engine.

Welding Kilns Saves Weight

IN THE ACCOMPANYING illustration is shown how a large all-welded kiln was shipped in one piece, on three flat cars, ready to set on its supporting rollers. It is complete except for its driving gear, which was shipped separately as a measure for protecting the teeth.

The kiln, made by the Traylor Engineering & Manufacturing Co., Allentown, Penn., is 8-ft. in diameter and 125-ft. long, full-welded throughout, making it lighter and stronger than the riveted type.

Kilns were formerly fabricated in sections, each of which was made in single, two or three segments, depending upon the diameter and plate sizes. The segments were assembled by means of horizontal butt straps, or strips of steel, at least as thick as the shell metal, and double or triple riveted.

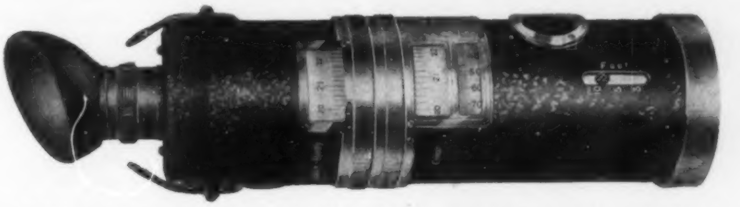
Several of the sections composing the kiln shell were joined by very wide, thick, circular butt straps, at least triple riveted to form parts of its full length, and were then shipped, the parts being joined on the job to form the complete shell. While these kilns made by the old method were strong and durable, they were heavy and difficult to handle.

Color Pyrometer Uses Discs

PYROMETER INSTRUMENT CO., New York, N. Y., has patented a combined color pyrometer, whose measuring principle was evolved, after years of scientific research, into a convenient and handy self-contained instrument for practical purposes. The present invention is based on the use of light filters and color wedges which are transparent to a number of colors simultaneously. By using filters with a number of transparencies both for separation and for mixing and toning down, any complicated optical or mechanical device for the production or combination of colors is rendered superfluous and the creation of a surprisingly simple temperature measuring device in the form of colored discs is rendered

All-welded kiln being shipped on three flat cars

possible, it is claimed. The new Pyro "Bi-Optical" pyrometer is said to be the only instrument for technical and scientific measurements by which the tem-

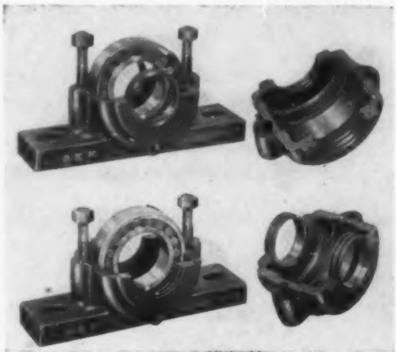


Color pyrometer uses filters and color wedges as a temperature measuring device

perature of the "black body" and the "actual" temperature may be ascertained simultaneously. The instrument is furnished with scale ranges from about 900-1900 deg. C or 1700-3500 deg. F.

Bearing Seal Prevents Lubrication Leakage

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Penn., has announced that a patented "Triple Seal"



Piston rings on either side of housing seal bearings

to protect bearings against lubrication leakage, dust, dirt, and moisture is now available to the industry.

As can be seen in the illustration, this seal consists of two split piston rings on each side of the housing and grooved on the outside diameter to form a labyrinth seal with the two end bores of the housing. Each ring has an inward tension that enables it to turn with the shaft.

On either side of the housing, two rings are mounted on the shaft with the splits 180 deg. apart to prevent lubricant leakage through the splits. The function of the inner ring is to serve as an internal flinger, and the outer ring to keep dirt and other foreign substance from entering the housing.

Because these rings are not securely fastened to the shaft, the seals are free to locate themselves axially whenever shaft expansion occurs. Close clearances, it is claimed, are maintained at all times between the rings and the housing. The rings, of cast iron, are hammered on the outside diameter in order to obtain the required inward tension to hold them properly on the shaft.

Miniature Precipitator

Western Precipitation Corp., Los Angeles, Calif., displayed a miniature Cottrell electrical precipitator, designed to make precipitating action visible, at the recent metals-mining convention in Los Angeles.

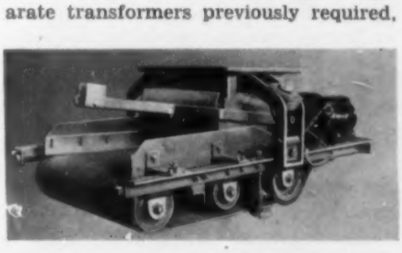
The demonstrating precipitator handled only a few cubic feet of gas per minute, but was built on the same principles as are followed in the large commercial installations for the treatment of several hundred cubic feet of gas per minute. In addition to the small precipitator, two new orifice-type gas scrubbers were exhibited.

Truck-Mounted Shovel

The Hanson Excavator Works, crane and shovel division of the Hanson Clutch and Machinery Co., Tiffin, Ohio, has brought out a so-called truck shovel weighing 12,000 lb. This mounting facilitates transportation from one location to another. It is built in 3/8 cu. yd. to 3/4 cu. yd. capacities, and is available as a shovel, crane, clamshell or dragline. Clutches and brakes are hydraulically controlled. The Comet, as it is known, is so constructed that when necessary, the clutch shoes or shaft assemblies may be removed without disturbing any other part of the machine.

Improve Constant Weight Feeder

Hardinge Co., Inc., York, Penn., has announced an important improvement in the constant weight feeder, which permits the use of 440 and 550-volt motors, and gear motors on the feeder frame, itself, without resorting to separate transformers previously required,



Constant weight feeder has flexible armored electrical connection

because of the flexibility of the connections employed.

Other improvements made are said to increase the accuracy of the feeder in handling coarse materials. It is now possible to feed rock up to 18 in. in diameter to the crusher with the "D" feeder, but the very important use for this equipment is the feeding of finer materials from 2 in. on down to dust.

Shovel mounted on truck facilitates transportation from one location to another

NEWS about People

NELSON SEVERINGHAUS, superintendent of Consolidated Quarries Corp., Lithonia, Ga., recently won cash awards totaling $1,623.33 in the contest for the best papers on welding submitted to the Lincoln Arc Welding Foundation. He won first prize in the trailer division and fourth prize in the automotive classification. Mr. Severinghaus is well-known to ROCK PRODUCTS readers for his valuable contributed articles on subjects of interest to quarry operators. He has also been a speaker at conventions.

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CONRAD C. MILLER, formerly purchasing agent of the Pennsylvania-Dixie Cement Corp., Nazareth, Penn., has been placed in charge of the company's real estate holdings and assigned to other special duties under the direction of W. H. Klein, vice-president and general operating manager. W. L. Pearson has been appointed purchasing agent, and C. F. Fehnel will serve as his assistant. W. Jess Brown will supervise local purchases at the Chattanooga, Tenn., office and C. W. Ellis will continue as local purchasing agent at West Des Moines, Iowa.

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PAUL C. VAN ZANDT, vice-president in charge of operations, Universal Atlas Cement Co., on November 2 spoke before a joint meeting of the Lehigh Valley section of the American Institute of Mining and Metallurgical Society and the Lehigh University section, Mining and Geological Society, in Williams Hall, Allentown, Penn. Mr. Van Zandt's subject was, "Engineering and Experiences in the Orient".

•

W. H. HILDEBRANDT has been elected vice-president and general manager of the Edison Cement Corp., West Orange, N. J. Mr. Hildebrandt has been vice-president of Edison Industries at Orange, N. J. W. J. Dittmar, Stewartsville, N. J., has been promoted from superintendent to plant manager, and G. C. Wilsnack, from chemical engineer to assistant plant manager.

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HOLLAND W. SMITH has been promoted to the position of general sales manager of Thompson-Weinman & Co., Cartersville, Ga., operating two crushed stone plants in Georgia, and others at Waltham, Mass., Norristown, Penn., and Sparta, Tenn. A new plant also is under construction at Bloomington, Ind. Mr. Smith will have his headquarters at 52 Vanderbilt Ave., New York City.

•

MARK R. WOODWARD has been appointed chief engineer of the Marblehead Lime Co., Chicago, Ill. Mr. Woodward was formerly with the Babcock-Wilcox Co., in the cement mill division, and prior to that was assistant chief engineer of the Lehigh Portland Cement Co.

•

ARTHUR M. HILL has been appointed president of the West Virginia Sand and Gravel Co., and the Standard Brick & Supply Co., Charlestown, W. Va., to succeed George E. Sutherland, who died August 12. Mr. Hill enters the rock products industry as a well known figure in transportation circles. He is president of the Atlantic Greyhound Lines, Inc., Capitol Greyhound Lines and Charleston Transit Co. and also serves as director of the Greyhound Corp., Kanawha City Co., Kanawha Bank & Trust Co., Kanawha Land Co., and Diamond Ice & Coal Co. Mr. Hill is prominent in trade association activities. He is president of the National Association of Motor Bus Operators; a member of the Joint Committee of Railroads and Highway Users; is a member of the American Automobile Association and served as director, member of the executive committee, 1928-1935; director of the Chamber of Commerce of U. S.; member of the American Electric Railway Association and was on the executive committee, 1932-34.

Arthur M. Hill

•

DR. J. V. N. DORR, president of The Door Co., Inc., New York, N. Y., was honored on November 4 with the award of the Chemistry Industry Medal which will be presented at a joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society. Dr. Dorr will present a paper at the meeting entitled, "The Influence of the Laws Relating to Research and Invention on Human Progress."

•

WILL H. COGHILL has been appointed supervising engineer, Southern Experiment Station, Bureau of Mines, Tuscaloosa, Alabama. He also has been promoted to the post of principal engineer, Nonmetals Division. Following 14 years of practical experience as a mining engineer, Mr. Coghill entered the service of the Bureau as a metallurgist in 1917, and has served continuously with the Bureau since that time.

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C. L. WAGNER, vice-president of Superior Portland Cement, Inc., Concrete, Wash., is rapidly recovering from the effects of a stroke, according to recent reports. Although Mr. Wagner had been in ill health for some time, he had recently shown considerable improvement.

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SEWELL L. AVERY, chairman of the board, U. S. Gypsum Co., Chicago, has resigned as president of Montgomery, Ward & Co. He will continue as chairman of the board of the big mail-order concern.

•

J. M. FAIRWEATHER has been appointed manager of the Spruce Pine Mica Co., Spruce Pine, N. C., succeeding the late Erastus Greene.

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JOHN M. NORTHMORE, formerly vice-president of the Producers' Stone and Gravel Co., died November 16 in Long Beach, Calif., where he had lived since his retirement in 1930. He was 76 years old. Mr. Northmore was born in Ishpeming, Mich., and began work with the Chicago and Northwestern Railway there. In 1905 he came to the general office of the company in Chicago.

VINCENT P. AHEARN, executive secretary of the National Sand and Gravel Association, will serve as chairman of the sessions at the meeting on Decem-

ber 5th of the National Industrial Council. This council meeting will precede the three-day meeting, December 7, 8 and 9 of the National Association of Manufacturers' Congress of American Industry at the Waldorf-Astoria Hotel, New York.

Heads Company

STIRLING TOMKINS, vice-president of the New York Trap Rock Corp., New York City, has been elected president of the company, effective January 1, succeeding Mortimer D. Wandell, who is retiring after years of service. The new president is 44 years old and has been in the crushed stone business, more or less, ever since he was a boy. He was born in Tomkins Cove, N. Y., on the west shore of the Hudson River, not far above New York City, where his father was founder and president

Stirling Tomkins

of the Tomkins Cove Stone Co. Stirling Tomkins entered Cornell University with the class of 1916, but two years later left to return home to fill a position with the Tomkins Cove Stone Co., created by the death of his father. By 1917 Stirling Tomkins had become general manager of the company. With the entrance of the United States into the World War, in the spring of 1917, he received leave of absence from his company and joined the army. In 1918 he was commissioned Second Lieutenant and went over seas in March, 1918. In France he had charge of gunnery instruction at St. Jean de Monte of American flying cadets. Promoted to First Lieutenant in October, 1918, he returned to his home in the spring of 1919, and again took up his duties as general manager of the Tomkins Cove

Joseph C. Dooley

Stone Co. In 1921 Mr. Tomkins was made president and in 1926, when his company was absorbed by the New York Trap Rock Corporation, he became vice-president of the latter. He is married and has two teen-age children, a boy and a girl; and believe it or not, his principal recreation is farming. Mr. Tomkins is a modest gentleman, and while he has been active in the National Crushed Stone Association and is one of its vice-presidents and has many friends, we dare say none of them knew as much of his history as we have reported here. His family christian name Stirling, by the way, comes from his ancestor Lord Stirling, the American nobleman of Revolutionary fame.

Mr. Tomkins' principal assistant will be Joseph C. Dooley, vice-president in charge of sales.

Wilson P. Foss, Jr., is chairman of the board of directors.

Obituaries

ALTON C. DUSTIN, a director of the Medusa Portland Cement Co., Cleveland, Ohio, and a prominent attorney, died on November 17. He was 79 years old.

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MASON B. GIBERSON, SR., president of the National Foundry Sand Co., Detroit, Mich., died recently following a brief illness. Mr. Giberson was survived by a wife and four children.

•

PAUL A. HOLCOMBE, district sales manager of the Hercules Cement Corp., Philadelphia, Penn., died November 3. He was 54. Mr. Holcombe had been associated with the Hercules company for 20 years.

T. WALTER GLASS, New England district manager for the Universal Atlas Portland Cement Co., died recently at his home in Jersey City, N. J. Mr. Glass had been employed by the company for 30 years.

•

MAJOR LAWSON MOORE, vice-president, secretary and treasurer of the Union Sand and Gravel Co., Spokane, Wash., and prominent pioneer of this city, died recently. Major Moore was a graduate of West Point, and during the World War was an aide to General Dickman in the army of occupation.

•

JAMES B. PRESTON, president of the English Mica Co., Spruce Pine, N. C., passed away recently. C. S. Gunter will continue in charge of production, and J. B. Preston, Jr., will remain in charge of sales at the New York office.

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RUSSELL J. HAWN, vice-president of Monsanto Chemical Co., died in Birmingham, Ala. Mr. Hawn was at one time associated with the Phoenix-Portland Cement Co.

•

RICHARD P. BLACKMER, treasurer of the Franklin Limestone Co., Franklin, Tenn., died recently. Mr. Blackmer had been connected with the company for 16 years.

•

ARTHUR FRIED, kidnapped manager of the Colonial Sand and Gravel Company's Bronx, N. Y. plant, was killed and his body cremated, according to newspaper reports. He was reported missing on December 4, 1937.

•

MAJ. GEORGE E. MASON, pioneer in the development of South Dakota and Wisconsin granite quarries for production of crushed stone, died in Chicago, Ill., October 31, at the age of 98 years. He served in the Union Army throughout the Civil War, retiring with the rank of major. Subsequently among his business activities was the Del Rapids (S. D.) Quarry Co., of which he was president.

•

R. H. GUMZ, former owner of a quarry at Lannon, Wis., died on November 4 at the age of 76.

•

E. S. CANON, master mechanic of the Superior Cement Corp., Superior, Ohio, died suddenly on October 8 from an attack of pneumonia. He had been chief electrician and master mechanic for the past 11 years.

•

FERDINAND H. BUSCHING, secretary and assistant treasurer, Cleveland Quarries Co., Cleveland, Ohio, died on November 12. A native of Germany, Mr. Busching came to this country when he was 14.

NATIONAL ASSOCIATION ACTIVITIES

Sand and Gravel

NATIONAL SAND AND GRAVEL ASSOCIATION, V. P. Ahearn, executive secretary, has informed its members regarding the application of the Federal wage and hour law to truck drivers as follows:

Truck Drivers

"Section 13(b) of the law states that 'The provisions of Section 7 shall not apply with respect to any employee with respect to whom the Interstate Commerce Commission has power to establish qualifications and maximum hours of service pursuant to the provisions of Section 204 of the motor carrier Act, 1935—.' Thus it is to be seen that whereever the Interstate Commerce Commission has the power to establish maximum hours of service under the motor carrier act, the Federal wage and hour law does not apply to such employees insofar as maximum hours of employment are concerned, since it is Section 7 of that law which limits hours of employment.

"By turning to the motor carrier act, we discover that Section 204 stipulates that 'it shall be the duty of the Commission— * * * (3) To establish for private carriers of property by motor vehicle, if need therefor is found, reasonable requirements to promote safety of operation, and to that end prescribe qualifications and maximum hours of service of employees, and standards of equipment. In the event such requirements are established, the term "motor carrier" shall be construed to include private carriers of property by motor vehicle in the administration of sections 204 (d) and (e); 205; 220; 221; 222 (a), (b), (d), (f), and (g); and 224.'

"The Interstate Commerce Commission obviously has the power to prescribe maximum hours of employment for truck drivers when such drivers are engaged in interstate commerce. Therefore, in the case of truck drivers engaged in interstate commerce, the Federal wage and hour law has no effect so far as maximum hours of employment are concerned. This provision applies to the drivers of company-owned vehicles, since they are private carriers of property within the meaning of the motor carrier act. Attention is also called to the fact that under Section 204 of the motor carrier act, the Commission also has the right to regulate hours of employment of common carriers by motor vehicle and contract carriers by motor vehicle. Therefore, in the case of independent trucking firms, the drivers of trucks owned by those firms are covered, so far as maximum hours of employment are concerned, by the motor carrier act and not by the Federal wage and hour law.

"It is important to keep in mind that Section 13(b) of the Federal wage and hour law exempts truck drivers only from Section 7 (maximum hour control), and does not exempt such truck drivers from the other provisions of the act, including minimum wages and the maintenance of adequate records. We recognize that there may be border-line cases which require additional information before the policy of employers can be established in respect to the two statutes in question. There may be truck drivers subject neither to the motor carrier act nor to the Federal wage and hour law because they are exclusively engaged in intrastate commerce, and there may be truck drivers not covered by the motor carrier act but possibly subject to the Federal wage and hour law because they are used in intraplant transportation as a necessary antecedent to the production of goods which move in interstate commerce. Our purpose here is only to state the general rule, and we invite member companies to correspond with us on any doubtful cases as to which more specific advice is required."

1939 Conventions

Concrete Industries Convention and Exposition, at the Sherman Hotel, Chicago, Ill., February 7, 8, and 9.

National Crushed Stone Association, annual convention and equipment exhibit, at the Netherland Plaza Hotel, Cincinnati, Ohio, January 30, 31, and February 1.

National Sand and Gravel Association, annual convention and machinery exhibit, at the Netherland Plaza Hotel, Cincinnati, Ohio, January 25, 26, and 27.

National Ready Mixed Concrete Association, annual convention and exposition, Netherland Plaza Hotel, Cincinnati, Ohio, January 25, 26, and 27.

Walsh-Healey Act Wage Scales

The association is acting with the National Crushed Stone Association and the National Slag Association to organize a committee to act with the United States Labor Department in the determination of prevailing minimum wages to be applied under the Walsh-Healey act (covering U. S. Government contracts for materials in excess of $10,000). For that purpose questionnaires are being prepared to be sent to all producers. It is urged that they be filled out and returned promptly by all recipients, because the more data available the stronger the case; or the more accurate the prevailing minimum wage established will be.

This information has already been supplied by the ready-mixed concrete industry, which is in a separate classification.

Crushed Stone

A. T. GOLDBECK, engineering director, National Crushed Stone Association, has published in the September-October *Journal* of the association an article on "Stone Screenings for Stabilized Base Construction," which should prove helpful in finding new markets. After briefly describing what stabilization means, Mr. Goldbeck gives the results of two series of tests made in the association's Washington laboratory, from which it was concluded that "the best stability is obtained when the aggregate is graded to give high density and when there is sufficient bituminous material present to make for low absorption and to furnish some resiliency in the mix. Additional tests will be conducted involving other variables and when completed, this investigation should give rather definite information regarding the proper use of screenings in stabilized base construction.'

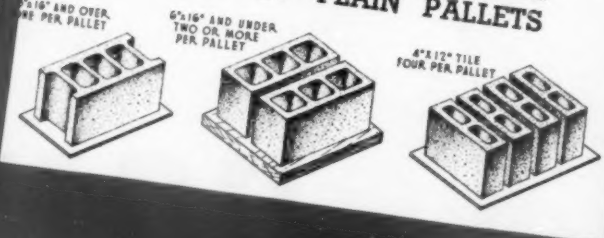
(Continued on page 75)

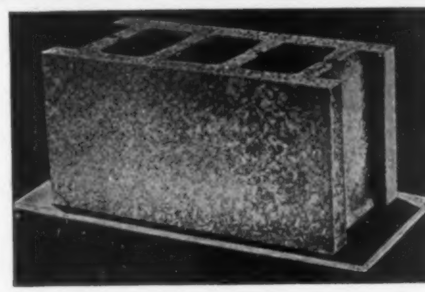
CONCRETE PRODUCTS and CEMENT PRODUCTS

Keep Half Your Equipment Cost In Your Pocket

BESSER
PLAIN PALLET STRIPPERS

Pay for themselves with saving in Pallet cost by making all units on
ONE SET OF PLAIN PALLETS





FULLY PRESSED TOP

FULLY PRESSED TOP concrete masonry units—made exclusively on Besser Plain Pallet Strippers—proved to be the most progressive step in the industry since the introduction of Besser Plain Pallet Strippers and making all units on ONE SET OF PLAIN PALLETS.

Besser has always kept in the lead with economical machines making highest quality product. Nothing is now being overlooked to keep this leadership. When better dependable methods or better machines or better products are perfected, Besser will still be found in the lead.

BESSER PLAIN PALLET STRIPPERS

FULLY AUTOMATIC—3 Models—Capacities: 2000 to 4000 units per day.
SEMI-AUTOMATIC—4 Models—Capacities: 1000 to 2000 units per day.
POWER OPERATED with Hand Controls—2 Models—Capacities: 500 to 1000 units per day.
MULTI-MOLD—Hand Operated—Capacities: up to 300 units per day. For manhole blocks, brick, slabs and small cored units.
AUTOMATIC BRICK MACHINES—Capacities from 10,000 to 50,000 units per day. For brick, slabs, coal cubes and other small units.

Besser Plain Pallet Strippers are made under one or more of the following Patents of which Besser Mfg. Co. is sole owner.

No. 1,472,399 by S. H. Pettengill
No. 1,572,305 by A. P. Nelson
No. 1,699,218 by J. H. Besser
No. 1,706,647 by J. H. Besser

These are the only patents ever granted on concrete stripper block machines using plain pallets, and they completely cover the basic pallet stripper principle. Other patents pending on improvements. No firm or individual is licensed or allowed to make machines under any of these patents.

Ask for Besser Plain Pallet Stripper Catalog. State Production Capacity wanted.

BESSER MANUFACTURING CO.

COMPLETE EQUIPMENT FOR CONCRETE PRODUCTS PLANTS

Complete Sales and Service on BESSER, ANCHOR, CONSOLIDATED, IDEAL, HOBBS, UNIVERSAL, PORTLAND

212 38TH STREET — ALPENA, MICHIGAN

BESSER BATCH MIXERS

5, 12, 18, 25, 30, 40, 50 cu. ft. capacities

Besser Batch Mixer with Skip Loader as mounted over Besser Plain Pallet Stripper.

Blades and Sectional Liners made of Wear-Long Metal.

Ask for Besser Mixer Bulletin

Another Advance Made In Precision Control

Guarantee Certificate Issued With Each Load of Concrete

By BROR NORDBERG

A development entirely new to the ready-mixed concrete industry was inaugurated recently by the Koenig Coal and Supply Co., Detroit, Mich., when its plants were equipped with scientific precision equipment to control factors which contribute to concrete failures and increase costs.

The system, which was developed by the Scientific Concrete Service Corp., Washington, D. C., and is now installed in Koenig's three plants, consists essentially of a service which provides facilities that take the "guesswork" out of concrete design and control. An exhaustive study of concrete manufacture and the types of control equipment needed has been made by this company, the results of which are now available to Koenig Coal and Supply Co., in what is known as the complete "(SC)²" service.

Undoubtedly, the Koenig Coal and Supply Co., is one of the most progressive producers of ready-mixed concrete in the United States. Three batching plants of modern design, all identical in capacity and arrangement, are operated by the company at three different locations in Detroit. These plants are situated on Scott street, Plymouth road and Seven Mile road.

Each of the plants is of all-steel construction with four-compartment, 300-cu. yd. capacity Butler bins and 4-cu. yd. Butler batchers. The company is also a producer of sand and gravel at Oxford, Mich., much of which is shipped into the Detroit area by rail to be merchandised as concrete. Bot-

One of the transit mixer trucks leaving after it has received its charge of cement, aggregates and water

tom-hoppered cars discharge into the boot of a bucket elevator, in each case, for delivery into the plant bins. Similarly, bulk cement is handled into a separate bin of 375-bbl. capacity. The Koenig fleet consists of twenty-five 4-cu. yd. and ten 3-cu. yd. capacity Jaeger transit mixers mounted on Mack trucks. Capacity of the three plants is estimated at 300,000 cu. yd. of concrete annually.

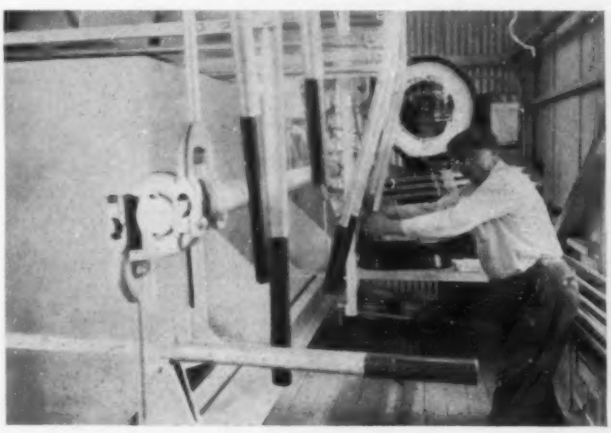
With the installation of (SC)² service this year there has been a substitution of special patented weighing equipment in each plant and a change in the grading of aggregate shipped into Detroit. These are the principal physical changes. The service comprises control of concrete manufacture, research, and technical advice to the Koenig Coal and Supply Co., the benefits of which are in turn passed on to the customer.

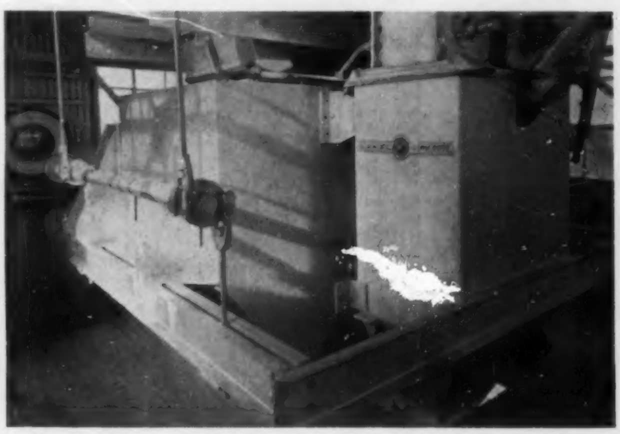
Control Every Step In Concrete Manufacture

All factors which enter into the manufacture of concrete are under control to give the desired results economically. This applies particularly to the control of the cement-water ratio on which the qualities of any concrete depend. Compressive strength is maintained at precisely the predetermined figure by eliminating factors which ordinarily unbalance the cement-water ratio. Elimination of segregation in handling has reduced volume changes in the concrete. By making each batch of concrete to exact grading specifications, a concrete of maximum density with minimum volume change is obtained. Also, by installing facilities to control with exactness the quantity of each ingredient in each batch it is possible to make concrete to order to fit any placing requirement.

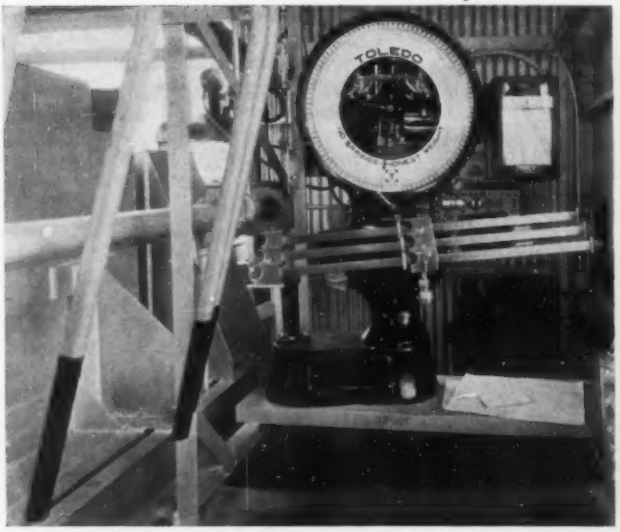
Probably the greatest saving to Koenig is in the means used to obtain the minimum cement-water paste required for a given strength. This is a function of the total mixing water as well as the proper gradation of aggregates.

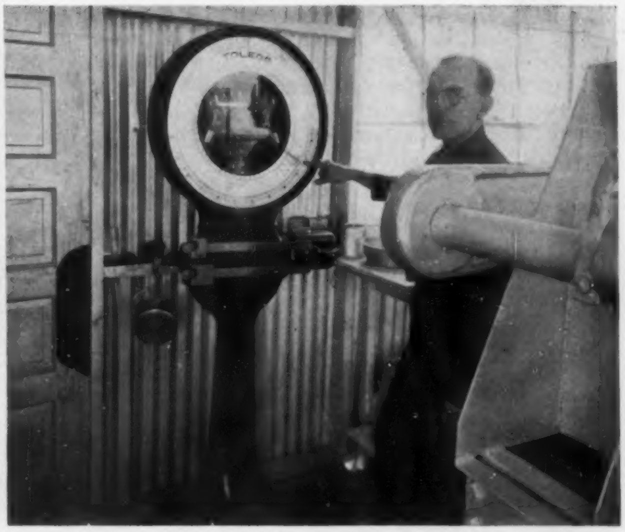
Control equipment has been installed in each of the three plants, consisting of two units of Toledo scale equipment, one for the determination of moisture in the aggregates and the other for batch weighing and moisture compen-





Left: Plant operator weighing out aggregates. Every move he makes is recorded on the graph recorder in background. Right: Four cubic yard batcher for aggregates controlled by levers





Left: Batching scale and recording graph which regulates all operations for a permanent record. Lines on graph record when each ingredient is weighed out. Right: Technician demonstrates use of auxiliary scale indicator from which moisture determinations of aggregates are taken

sation. The Scientific Concrete Service Corp. has placed a trained concrete technician at each plant, who performs the necessary determinations and tests, designs mixes and guarantees that each batch of concrete has met the required strength. His role is chiefly one of service, relieving the concrete concern and its employes of the responsibility.

Use Four Sizes of Aggregates To Prevent Segregation

Mixes are designed on an accurate volume basis determined by specific gravity. Bin segregation is eliminated by having four sizes of aggregate delivered separately into bins, including 1½ to 1-in. gravel, 1 to ½-in., ½- to No. 4 and minus No. 4.

By splitting the coarse aggregate into three sizes with proportionately low differences in dimensions of the particles in each grading, segregation is practically eliminated.

One of the principal reasons for concrete not coming up to expectations is the wide variation in moisture content of the aggregates on any particular day. Special care is therefore taken by the technician to determine frequently the moisture in all aggregates and advise the plant operator of any change.

Variations in surface moisture contained in the sand usually average three or four percent, but sometimes run as high as six percent. Gravel moisture averages ½ to 1½ percent and sometimes reaches 2 or 3 percent. Such differences will, of course, affect the cement-water ratio and the mix consistency.

Check Moisture Frequently

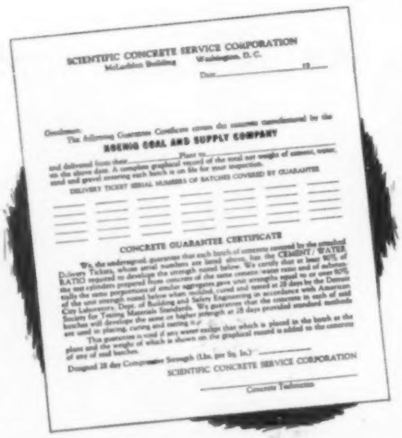
A pyconometer is used by the technician to determine the specific gravity of all materials. Frequent samples of gravel and sand are taken from the batcher to check variations in moisture content so that the mix can be changed accordingly. Moisture determinations

Left: One of three modern ready-mixed concrete plants operated by Koenig Coal and Supply Co.

Right: Showing elevator at one of the plants for placing aggregates into bins direct from cars

are made on a special patented Toledo scale which has a specific gravity gauge and a scale for reading direct the percentage of moisture. The entire operation takes $2\frac{1}{2}$ minutes, and an alternate method is provided requiring only one minute. These determinations are made at least once each hour and sometimes more often.

The batching out of the mix is definitely controlled on the batching floor where a special 6-beam Toledo scale has been installed. One man is needed to take care of all operations. The exact quantity of each ingredient is assured by this scale, which has a separate beam for each ingredient with provision for moisture compensation in both aggregates and electric cut-offs. The usual mix requires the weighing of cement, water, sand and two gradings of coarse aggregate. A graphical record next to the scale dial shows every movement of the weighing scale, a definite proof that the exact quantities of each ingredient were placed in the batch.



Guarantee certificate issued with every ready mixed concrete delivery ticket

Operating Procedure to Assure Accuracy

Operating procedure is simple and very rapid. The operator moves the sand counterpoise out to the amount of dry sand required in the mix. He then adds to the counterpoise a percentage weight based on the percentage of moisture contained in the sand. This movement is recorded on the graph. The sand lever is then released and the sand is placed in the weigh hopper until the scale indicator returns to zero.

The process is repeated for gravel, with the counterpoise set for the total gravel weight, whether it includes one, two or three grades of gravel, and a correction weight for moisture is added. Then one size of gravel is weighed in down to a predetermined weight on the scale, the gate is closed and the other grade is released until the indicator returns to zero. The graphical record is continuous but records all changes in operation instantaneously. Cement is handled precisely in the same way. On water, the counterpoise is set for the total weight of water required. The water valve is opened and immediately the moisture percentage weights for sand and gravel are removed, subtracting that amount of water. The water is shut off automatically through a mercury magnetic switch on the scale which actuates a solenoid trip on the water valve. The graph has a speed of $1\frac{1}{2}$ in. per hr. between each batch, which automatically increases to $1\frac{1}{2}$ in. per minute during the batch cycle.

The plant technician submits the batching figures to the operator and advises him of changes. When the batch weights are changed, the technician makes a record on the graph, recording the serial number of the delivery ticket for the particular load, the percentage of moisture in the sand and the gravel, the hour, the date and his initials.

The graphs may be locked, if desired, and are a permanent record for each batch, which are kept on file where they may be seen. The graphs are filed according to serial numbers, each box bearing on its face the time and date the graph was installed, removed and the serial numbers included.

The graph was manufactured by the Esterline Angus Co., Indianapolis, Ind.

In addition to these control features, a series of mixes are being worked up and indexed for almost every possible concrete mix. Samples are taken of the fresh concrete on the job to check the water-cement ratio, and occasionally test cylinders are made up from concrete taken off the site and submitted to testing laboratories for a further check. As part of the service, recommendations are made for mixes to fit particular conditions, and some promotional sales work is done.

Even the mixer driver must coöperate. Each driver upon return for another load must empty his mixer in a sump provided at the yard, and a mirror on the batching floor allows the dispatcher to see into each truck mixer as it backs under the hopper to make certain that wash water has been emptied out. The total mixing water is being held constant to within 1 percent. Every batch of concrete delivered has a certificate signed by the technician guaranteeing the strength of the concrete; copies of the certificate are filed with the delivery ticket and sent to the contractor or architect.

(SC)² service is new in its entirety, but has been in operation in a modified form for six years in the plants of William Blakeslee and Sons, New Haven, Conn., and Edward Balf Co., Hartford, Conn. A. J. O'Connor, vice-president of Koenig Coal and Supply Co., and secretary of the National Ready-Mixed Concrete Association, and Russell Peirce, general superintendent, both have taken an active part in introducing certified concrete to the Detroit building industry.

Build New Concrete Pipe Unit

The Cowart Construction Co. has started construction of a large concrete pipe factory at Eufaula, Ala., on a site of approximately 15 acres. About 150 men will be employed, according to a local report. In addition to the Eufaula plant, three others will be erected in Alabama at Selma, Mobile and Birmingham. The company owns a patent on a lock-joint concrete pipe, and will do only an intrastate business to be within provisions of the new wage and hour law, states the report. This concern, which has plants in several states, manufactures concrete pipe in sizes from 4 in. to 5 ft. in diameter. It also makes culverts, silo staves, settling basins, and like products.

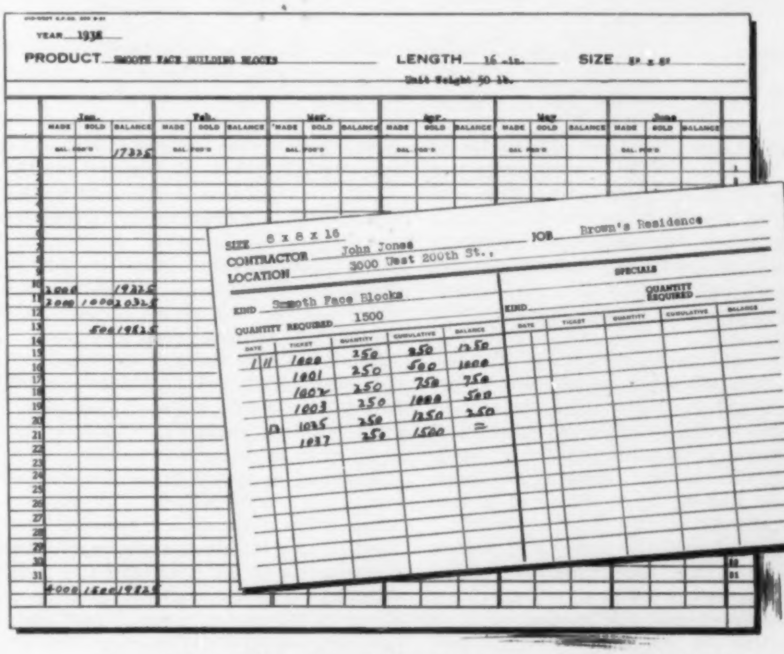
Cunard-Lang Concrete Co., Columbus, Ohio, furnished the concrete block for the General Electric prize home erected in Columbus. George Lang is manager of the company.

Efficient Record Forms for Concrete Products

The Midwest Concrete Pipe Co., Franklin Park, Ill., is using a simple but very efficient perpetual inventory record system that is a real time-saver.

A sample of this interesting record form, devised by Robert A. Ubbelohde, secretary-treasurer, is shown in the illustration. The form is printed on a heavy card paper, and is 8½ in. x 10¼ in. in size. It gives a daily, monthly, and yearly record by units of production, sales and the balance on hand of every product manufactured. Both sides of the card are used, each side giving a six-months' record. It will be noticed that there is a rather complete description of each product.

Another handy form used by this company is the job record card, shown in the illustration. This card gives a cumulative record of deliveries until the contract for materials has been completed. The amount delivered at any particular time and the balance remaining for delivery on the contract may be ascertained at a glance.



Forms used by Midwest Concrete Pipe Co. to keep cumulative job record

Variable Speed Vibration For Block Manufacture

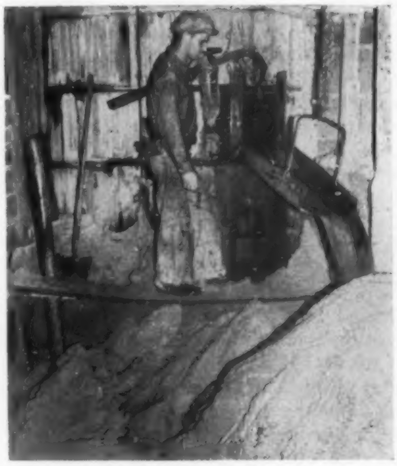
The Multiplex Concrete Machinery Co., Elmore, Ohio, is now offering a multi-variable speed vibration attachment for application to their Master Press, or any other model which they make, to meet the demand for vibrated concrete block. The Master Press is a semi-automatic machine with a capacity of from four to six blocks per minute with a force feed filling hopper which, it is said, will handle all kinds of material and produce quality units. At the 1938 Concrete Industries Show, this machine was shown with a hand jolt attachment. The present development is a further improvement in the application of vibration to block manufacture.

Another machine which will be on display at the 1939 Show will be the variable-speed, multi-vibrator press. With this machine, the frequency of vibration may be varied to suit the character of aggregate used in making the block. Tests indicate, it is said, that certain kinds of material require different types of vibration to obtain the best results.

Hankins-Paulson Co., Uniontown, Penn., is furnishing ready-mixed concrete for the manufacture of concrete pipe. This company also has had several large contracts to supply concrete for bridges.

The Perfect Concrete Block Co., Dayton, Ky., recently installed a new Besser, semi-automatic block machine.

Cut Cost of Making Block With Conveying System



Withdrawing sand from storage silo

Sand Requirements Taken from River With Dredge

Sixteen years ago John A Whitman, who was formerly mayor of Midland, Mich., found that the bed of Tittabwassee river consisted of a very good grade of sharp sand. He started taking out the sand in the winter by cutting holes through the ice and using long handled shovels to remove it from the river bed. It was then hauled away by horse-drawn wagons. A large amount of sand was sold at a good profit when it was impossible to get it from gravel pits.

The sand was so good and so plentiful that Mr. Whitman sought other uses for it and, noting a local scarcity of concrete building units, he established a concrete block plant on the river bank. Later, with his son, John A. Whitman, Jr., he formed J. A. Whitman & Son of Midland.

A year ago he made a complete change in his production equipment, and after about 14 months' experience is convinced that his present plant is operating on the lowest possible cost, considering the size of his market.

Enough sand to make 2200 standard blocks each day is pumped out of the river at small cost. An American-Marsh 75 hp. pump mounted on a scow, pumps the sand through 700 ft. of 8-in. pipe to two 30-cu. yd. wood stave tanks which allow surplus water to drain back into the river. It takes 45 minutes to put 20 cu. yd. of sand into one of the silos. The sand is withdrawn at the bottom in front of the mixer. It is measured in barrows and dumped into a 28-cu. ft. Stearns mixer, which discharges to a drag elevator that feeds the Stearns stripper block machine.

Sand is hard, sharp and clean, but not ideally graded. This difficulty could be made up by the generous use of cement but this would raise block costs. Block-making equipment used, however, is designed to secure maximum crushing strength with minimum cement.

One man at the mixer, one machine operator and two off-bearers, in 8½ hrs. production time put an average of 2200 plain, 33 1/3 per cent air space, stripper blocks in the curing room or 1400 rock face stripper blocks. The crew uses an additional hour for clean-up and greasing operations.

The new block machine is a Stearns power stripper with eight tamp bars. It is said that eight bar tamping not only corrects the difficulties due to uneven feed of material, inherent in all block machines, but produces a re-mixing of the material in the mold box.

An ingenious method for casting lintels, chimney blocks and dimension stone was worked out. A trap door was cut in the drag elevator trough which provided means for diverting the amount of mix needed for this work. Molds and a Multiplex chimney block machine are alongside the elevator.

Conveyor system within convenient reach of block machine operator reduces handling costs

Cinder Crushing and Screening Equipment

Cinder blocks also are made, using cinders hauled from the Milwaukee plant of Consumers Power Co., 20 miles away. Trucks dump the cinders into a storage bin at grade, and a bucket elevator hoists them to a New Holland vibrating screen where all the fine cinders are taken out. The cinders then go through a New Holland hammer mill crusher which crushes them to 1 in. The material is then put through a New Holland 4-roll crusher which reduces it to sizes ranging from ⅜ in. to dust. It then goes over a Simplicity vibrating screen and the oversize is returned to the hammer crusher. Finished cinders are conveyed by gravity to a material hopper which feeds another 28-cu. ft. Stearns mixer. Cinder concrete mix is also handled by a Stearns drag elevator and feeder.

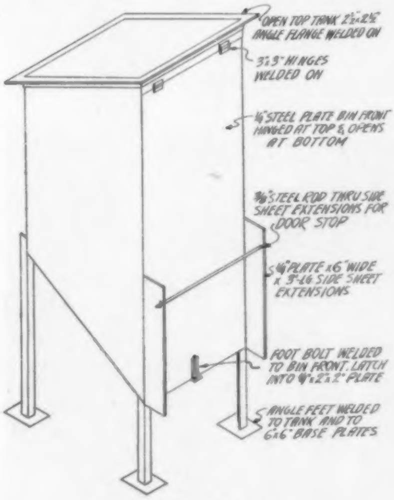
An important part of the layout is a steam boiler plant, with water softener. Steam pipes installed around and under the cinder pit keep this material from freezing in winter.

Cinder blocks are also made on a Stearns power stripper. The crew consists of a mixer man, operator and one off-bearer, producing 1800 units in a 7½-hr. day, with 1½ hr. additional time

for cleaning and greasing machines. Cinder block output per sack of cement runs about 19, with 28-day tests averaging 995 lb. gross area.

Curing Methods

From strippers to yard the handling of sand and cinder blocks is essentially the same. Sand blocks are carried to nearby curing racks by the off-bearers whereas the cinder product is placed on a power drag conveyor which takes them to the curing room. Curing under cover is effected in from 16 to 24 hr., depending upon atmospheric conditions by the use of Dowflake calcium chloride added



Details of material hopper

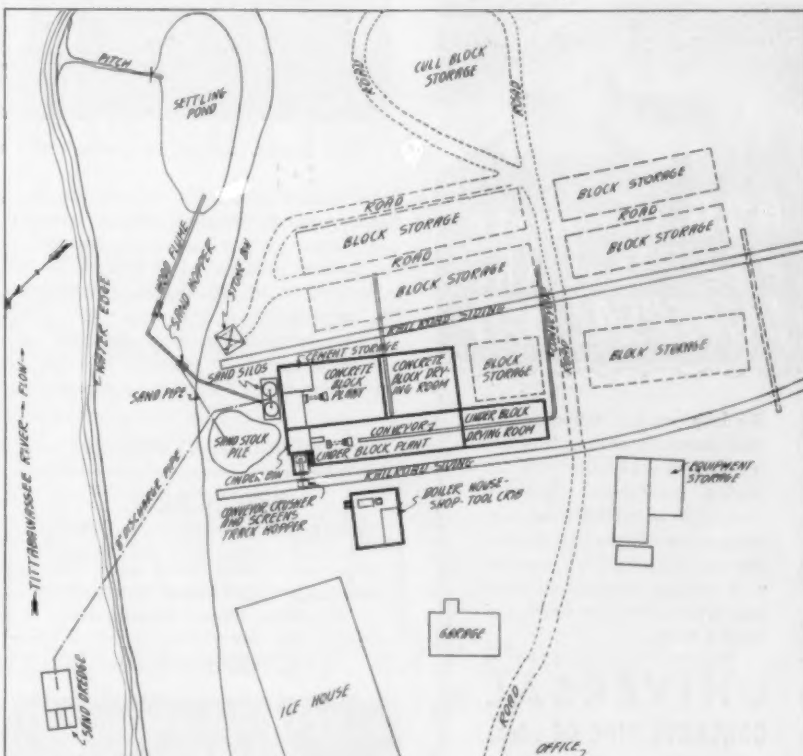
to the dry aggregates and cement at the mixer. From one to 1½ lb. of Dowflake is used to a bag of cement. This admixture, it is claimed, reduces moisture loss in the completed block and not only increases the compressive strength at 24 hr. but adds materially to the ultimate strength of the unit after it has been laid in the wall. A part of this strength increase is an indirect result, because the admixture is said to improve the workability of the concrete, an important feature when the tamping action above referred to is taken into consideration.

Cured blocks are loaded onto Matthews gravity carriers and conveyed to the storage yard. The place is a network of these carriers, some being moved frequently, some more or less permanently installed. Mr. Whitman long ago learned that it is cheaper to send a block 50 or 500 ft. on silent rollers than it is to have men lug the product those distances, so he provides his men with all the carriers that can be economically employed. The yard is laid out in lanes, each lane served by a branch gravity carrier. One type and size of product is piled on both sides of each aisle, withdrawals always being made from the

Block storage yard of J. A. Whitman & Son, Midland, Mich., with portable gravity type conveyor system operating in lanes

older stack. Careful records have been made of seasonal demands so that fall finds the yard neatly piled with the plant's various products in the proper proportions. If winter operation is discontinued temporarily, the plant therefore will always have on hand what the customer wants.

The Whitman selling methods are so simple as to amount to genius. Hard hitting newspaper copy stresses quality, price and service. In all his production policies, Mr. Whitman keeps in mind the needs of the ultimate consumer—the man who will have to pay for the house or the factory or the theater building in which the blocks are used. He strives to make a building unit as near waterproof as need be, with the strengths previously noted, clean cut and of accurate dimension, and he's selling 8- x 8- x 16-in. blocks in the yard at 9c a block. Blocks are delivered by truck as far as five miles at a price of 10c per block. His business has grown through the years so that his product has gone into some of the most important construction in communities as far as Saginaw on the east and Mt. Pleasant on the west.

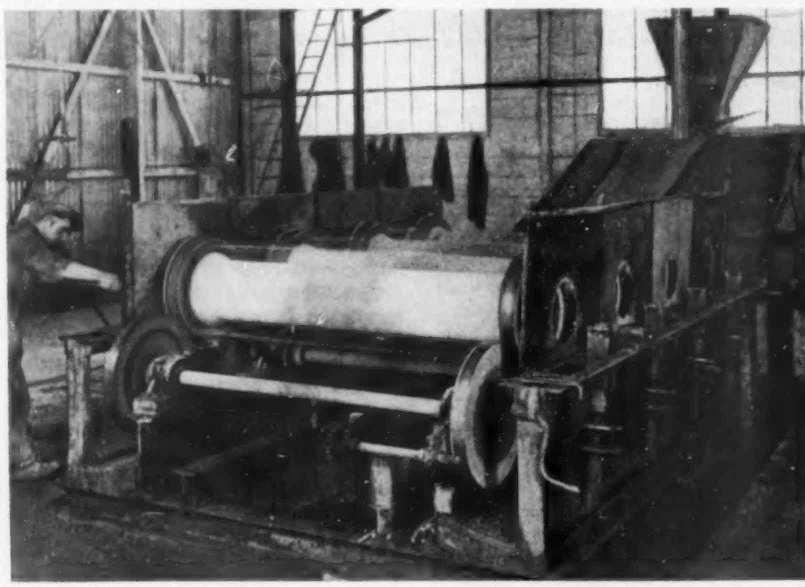


Layout of buildings and storage yard of concrete block plant operated by J. A. Whitman & Son

New Concrete Pipe Process Uses Spinning and Vibration

A COMBINATION OF CENTRIFUGAL SPINNING and concussion is used in a new process of making concrete pipe. The concussion or vibration is applied by the special machine in the early stages of the operation by means of an eccentric shaft. In the illustration may be seen one of the machines spinning four concrete pipes at once in the plant of John Ellis & Sons, Ltd., Stoney Stanton, Leicestershire, England, which has the sole rights for the use of the new process in that country. The process is the invention of W. R. Hume, Hume Pipe Co., Australia.

It is claimed that the vibration imparted to the pipe permits the use of low water-cement-ratios (approximately 0.35 to 0.4) and tends to avoid segregation of the aggregate in the pipe wall. The result is said to give increased density and strength to the concrete and avoids a layer of fine material on the interior surface of the pipe. The aggregate used is granite obtained from a quarry adjoining the plant. Machinery was designed by the Hume Pipe Co., but it is manufactured in England, states *Concrete Building and Concrete Products*, London.



New English machine for making concrete pipe by combined spinning and vibration

To the right in the illustration may be seen the traveling hopper used to transport the concrete from the mixer to the machines. The smaller pipe sizes are spun on machines capable of shaping four at a time, but the larger sizes are spun singly. The man on the left is finishing the inside of one of the pipes with a steel rod.

Materials for the larger pipes are fed by a belt conveyor into a hopper beside the machine. Clamps hold the finishing rod in position in the pipe mold.

KEASBEY & MATTISON CO., Ambler, Penn., are now producing asbestos-cement pipe in sizes ranging from 2-in. to 24-in. diameter, and in lengths of 10 ft. for small diameters to 13 ft. for diameters 4 in. and over. Lengths of the pipe are joined by a flexible coupling consisting of a malleable iron middle ring, followers and rubber gaskets.

The LEADERS Will Meet Again . . .

Representative contractors, products manufacturers, and ready-mixed concrete operators—the leaders in the Concrete Industry—always welcome new sales and merchandising ideas. They want to learn about and employ new methods and devices that will increase efficiency and lower costs.

Each year an increasing number of the aggressive executives get together and discuss intimately their common business problems. Their big get-together for 1939 will consist of

FOUR BIG ANNUAL EVENTS

The following Conventions . . .

AMERICAN CONCRETE CONTRACTORS ASSOCIATION
NATIONAL CONCRETE MASONRY ASSOCIATION
CAST STONE INSTITUTE

The Comprehensive Educational Display . . .

THIRD ANNUAL CONCRETE INDUSTRIES EXPOSITION
IN CHICAGO, FEBRUARY 7, 8, 9, 1939

When you participate in these great events—this educational program—you make one of the finest investments possible for yourself and your organization.

Everything is planned in advance, so you **save** time. In one place you see, inspect, the most comprehensive exhibit of concrete machinery, equipment, devices, and methods that represent the ingenuity of the best brains in your industry.

By all means plan now to meet with the other alert, aggressive business men in your industry. Come and increase your knowledge of time-saving, profit-making methods of genuine value to you. Grasp the opportunity of intimately discussing your problems with fellow contractors and products manufacturers. See...Inspect...Compare the various products that will help you to successfully shape your operating practices for 1939.

Concrete Industries Exposition and Conventions

Sherman Hotel, February 7, 8, 9, 1939

Exposition Offices: 400 West Madison Street, Chicago, Illinois

NEWS *of the month*

Lehigh to Modernize Alsen Plant

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., has awarded a contract to E. C. Machin Co., Allentown, for erection of an addition to its cement plant at Alsen, N. Y., to cost $250,000 or more. It is reported that about 200 men are now at work which will be carried on continuously with three shifts. The modernization work, it is expected, will take a year to complete. Changes will include new buildings, conveyors, silos for storing the cement and new improved machinery.

Argentine Cement Production Near Domestic Requirements

PRODUCTION OF CEMENT in Argentina is now almost sufficient to meet domestic requirements, according to official figures recently made public. In 1928 when the total consumption of cement amounted to 668,000 tons, 65 percent, or 440,000 tons were imported from abroad. However, the industry has grown to such proportions since that year that in 1937, when total consumption reached a record figure of 1,060,000 tons, the country produced 1,010,000 tons, or 94 percent of the total. Just recently a subsidiary of Lone Star Cement Corp., completed a plant with a capacity of 3000 bbl. of clinker per day.

THREE FORKS PORTLAND CEMENT CO., Hanover, Mont., has leased its cement storage silos at this plant to the Montana Flour Mills Co., for the storage of 300,000 bu. of wheat. Ten bins not being used for cement storage will provide needed storage facilities for a large wheat crop.

ASHGROVE LIME & PORTLAND CEMENT CO., Kansas City, Mo., has purchased two Diesel-electric switching locomotives from the General Electric Co., which are now being built at the Erie, Penn., works. The locomotives, which weigh 23 tons, are said to be an entirely new development for quarry haulage.

FLORIDA PORTLAND CEMENT CO., Tampa, Fla., recently was represented before Examiner John A. Russell of the Maritime Commission to protest against proposed increases in freight rates between the United States and outports of Puerto Rico. The rates complained of involved increases of 10 percent or more.

Iowa Farmers Buy Large Quantities of Limestone

BY THE END OF 1938, over 150,000 tons of limestone will have been produced and delivered to land owners in 24 counties of Iowa under the provisions of the County Limestone Quarries Act. Under the terms of this Act, county boards of supervisors are empowered to purchase and resell agricultural limestone to land owners. Purchase of the limestone is financed over a period of five years in five equal installments. Special anticipatory warrants are issued which are secured by a lien against the property benefitted. Thirteen counties are operating under this plan and 11 others are starting the program this fall.

Sand Price War in Louisiana

RAILROAD RATE REDUCTIONS on "land sand" were recently denied by the Louisiana Public Service Commission. The Southern Railway Co. and the Louisiana and Arkansas Railway Co. had asked for permission to lower the rate from 98c to 55c on the 103-mile haul from Cole, La., to New Orleans; the Gulf, Mobile and Northern asked permission to reduce the rate from 88c to 50c on 56- and 77-mile hauls. The application was opposed by the Louisiana Materials Co., Inc., and Jahncke Service, Inc., producers and carriers of "water sand". Both companies also are pit producers. W. L. Stevens, Jr., president of Louisiana Materials Co., Inc., said that he was more interested in stabilizing sand prices on a basis that would provide reasonable profit than in seeing a lower rail rate. He said that a "cat-and-dog" price war prevailing in New Orleans among sand concerns had lowered prices below levels "land producers" allegedly are able to meet. Lowering the rate, he is reported to have said, would intensify the "war". Paul F. Jahncke testified that the reduction would have a disastrous and chaotic effect on the industry. He pointed out that land sand can stand on its own merits in competition because of its superiority for certain specified construction work.

Improvements Made at Batesville Lime Plant

BATESVILLE WHITE LIME CO., Batesville, Ark., reports an unprecedented volume of business, necessitating operation at full capacity. The upturn in business started about the first of July, and has continued to increase, taxing facilities of the plant. About 140 tons of lime a day are now being produced. Improvements now being made at the plant include the erection of an elevator for use in separating chat and lime dust. It is a wood burning plant, 50 cords of wood being burned daily.

To Rebuild Stone Plant Destroyed by Fire

MORRIS LIMESTONE PRODUCTS CO., Morris, Ill., will rebuild its plant located 10 miles south of Yorkville on the Morris road, which was totally destroyed by fire recently, entailing a loss of $35,000, partially covered by insurance.

The building was erected 10 years ago from plans of the Stephens-Adamson Mfg. Co., Aurora, Ill., and was equipped by this company. Output was divided about evenly between agricultural limestone and crushed stone for road building. Demands for agricultural stone had been increasing.

Talc Company to Build Factory

SKAGIT TALC, INC., Sedro-Woolley, Wash., which operates a quarry on the upper Skagit across from Bacon Creek, will branch out into the manufacture of souvenirs and novelties in the near future. Lathes, cutting machines, and polishes are now being purchased for a factory to be constructed near Sedro-Woolley. J. B. McLean is manager of the company. The articles to be manufactured include ash trays, cigarette holders, frames, vases, and lampstands. A deposit of black talc has been found that resembles jade and polishes beautifully, according to a local report. Approximately $75,000 is now invested in the company. Improvements are being made in the quarry. Volcanic sand is also shipped by the company for use in making soaps and cleansers.

CONSUMERS SAND CO., Topeka, Kan., has reported that one of its dredges brought up sections of ivory tusks and part of a massive jaw bone from a prehistoric mammoth.

New Iowa Sand Company

RED OAK SAND Co., Red Oak, Iowa, is a new sand company which recently started operation with James Patterson in charge. The sand is obtained from the Nishnabotna river. Modern washing and screening equipment has been set up, and a dredge is now taking out material.

To Move Sand Plant

WAPAK SAND & GRAVEL Co., Wapakoneta, Ohio, has announced the purchase of a 120-acre tract of land in Union township for a future source of gravel supply. The land is located on the Wrestle Creek road two miles east of Uniopolis. A new plant will probably be constructed at the new location in about a year, according to W. P. Greer, secretary-treasurer of the sand company.

Cement Census Figures

THE BIENNIAL CENSUS of Manufactures, Washington, D. C., has issued figures for 1937 compared with the previous census in 1935. For the 158 establishments, the number of wage earners was 26,426 in 1937 as compared with 20,698 wage earners in 153 establishments in 1935. Wages amounted to a total of $34,070,128 in 1937 as compared with $20,903,694 in 1935. The cost of materials, supplies, containers, fuel, and purchased energy totaled $69,979,215 as against $42,937,928 in 1935. Products had a value of $183,201,048 in 1937 as compared with $120,417,129 in 1935. The value added by manufacture amounted to $113,221,833 as against $77,479,201 in 1935.

Japan Taking Over Chinese Cement Mills

FOUR CHINESE CEMENT PLANTS have been taken over by Japanese cement interests, according to a report of the Department of Commerce. These plants include: the Shanghai Portland Cement Works, Ltd.; the China Portland Cement Co., Ltd., Lunghua, Kiangsu province; Northwest Industrial Co., Taiyuan, and the Chee Hsin Cement Co. The total monthly capacity of these four plants was 52,000 tons. Shanghai Portland Cement Works will operate under the technical guidance of the Onoda Portland Cement Co., of Japan while the Mitsui Bussan Kaisha will take over sales. China Portland Cement Co. will be similarly directed by Iwaki Cement Co., and the Mitsubishi Shoji Kaisha. Northwest Industrial Co. will have both its operating and sales activities directed by the Asano Portland Co. Chee Hsin Cement Co. will have its sales directed by the Mitsui Bussan Kaisha Co., and the Shantung province plant will be operated by the Banjo Cement Co., of Japan, according to this report.

New Stone Crushing Plant in Indiana

THOMPSON-WEINMAN Co., Cartersville, Ga., has started building a new stone-crushing plant at Bloomington, Ind., according to an announcement made by Wm. J. Weinman, president. Jerne McEver will be in charge of this work. He has erected similar plants for the company at Norristown, Penn., Waltham, Mass., Sparta, Tenn., Tate and McIntyre, Ga.

Federal Indictment Against Stone and Sand Companies

AN INDICTMENT has been returned against 16 stone and sand companies and 32 individuals by the federal grand jury at Newark, N. J., charging that the WPA has been defrauded by approximately $250,000. The indictment charges that these companies organized a monopoly, fixing market prices. Corporations named were: A. B. McKee, Inc.; Samuel Braens Sons, Inc.; George M. Brewster & Son, Inc.; Brookswright, Inc.; Harrison Supply Co., Inc.; Orange Quarry Co., Inc.; Consolidated Stone and Sand Co.; Great Notch Corp.; Little Falls Sand and Gravel Co.; Paterson Crushed Stone Co.; Tidewater Stone and Sand Supply Co.; Union Building and Construction Co.; Burton-Canfield, Inc.; Newark Sand Co.; Passaic Transit Concrete Co., and Mulroy-Cooke, Inc.

Individuals named were Thomas Adametz, John Braen, Abram Braen, Alvin H. Alfast, William Brewster, August J. Seaman, George Brooks, Burton Canfield, George J. Fredericks, Irving W. Wortman, John L. Hill, Charles H. Hollenbeck, Everett E. Phillips, Everett E. Phillips, Jr., Elizabeth G. Kernan, Louis Kernan, David Lepre, Gennaro Lepre, Howard M. Malcolm, Edward D. Kilroy, George J. Mulroy, Edward J. Mulroy, Henry R. Carter, John O. Brennan, Richard Drukker, Louis Drukker, Richard S. Sowerbutt, John H. Sowerbutt, Herman B. Ferber, Franklin S. Weisberger, Dow H. Drukker and Abram Vandemade.

TOWER GROVE QUARRY AND CONSTRUCTION Co., St. Louis, Mo., was permanently enjoined from operating its quarry "in such a manner as to shake neighboring property by blasting and showering the neighborhood with dust from a rock crusher." A denial was made by the company that its operation, which it described as conforming with approved methods, constituted a nuisance.

FINANCIAL NOTES

RECENT DIVIDENDS ANNOUNCED

Alpha Portland Cem.	$ .25	Dec. 21
Asbestos Corp., Ltd.	.50	Dec. 31
Asbestos Corp., Ltd., extra	1.50	Dec. 31
Basic Dolomite	.10	Dec. 15
California Art Tile Co., cl. A	.25	Dec. 1
Canada Cement Co., 6½% pfd.	1.00	Dec. 20
Harbison-Walker Refractories, pfd.	1.50	Jan. 20
Kelley Island Lime & Tr.	.25	Dec. 15
Lehigh Portland Cem., pfd.	1.00	Jan. 2
Lone Star Cement	.75	Dec. 23
Superior Portland Cem., cl A.	.27½	Nov. 26
Superior Portland Cem., cl B.	.50	Nov. 29
U. S. Gypsum Co.	.50	Dec. 31
U. S. Gypsum Co., pfd.	1.75	Jan. 3

PENNSYLVANIA GLASS SAND CORP., Lewistown, Penn., has called for redemption on December 1 its 1st 4½s due on December 1, 1960.

VOLUNTEER PORTLAND CEMENT CO., Knoxville, Tenn., has called its 1st 7s, dated December 15, 1927 for redemption on December 15.

BEAVER PORTLAND CEMENT CO., Portland, Ore., has not paid at maturity on November 1, 1938 its first 7 percent mortgage bonds, according to reports. However, under the terms of a previous bondholders' agreement plan, the November 1, 1938 maturity can be postponed until November 1, 1940 without any default existing.

ASBESTOS CORP., LTD., Thetford Mines, Que., Canada, has reduced its funded debt to $500,000 as of September 30, 1938. This leaves only that amount of the series C 4 percent first mortgage bonds, due July 2, 1942 outstanding. At the end of 1937, the company had $1,000,000 in bonds outstanding. This company has declared the regular quarterly dividend of 50c a share and a bonus of $1.50 a share, payable December 31 to shareholders of record December 15. The current dividend brings the payments for the year up to $5 a share. No payments were made last year. According to the *Financial Post*, Toronto, it is rumored that a stock split of four to one will be made.

PENNSYLVANIA-DIXIE CEMENT CORP., New York, N. Y., reports net sales for the year ended September 30, 1938 as $5,957,750 as compared with $6,121,419 for the same period in 1937.

LONE STAR CEMENT CORP., New York, N. Y., has announced that sales for the nine months ended September 30, 1938 were $15,432,151 as against $16,372,735 for a like period in 1937. These totals include sales of the South American subsidiaries.

NATIONAL GYPSUM CO., Buffalo, N. Y., reported October earnings of $145,125 before income taxes, compared with $132,964 in September and $59,601 in October, 1937.

LONGHORN PORTLAND CEMENT CO., San Antonio, Texas, showed a net profit of $201,740 for the six months ended June 30, 1938, according to a recent financial statement. This compares with $219,547 for the same period in 1937. Earnings on the 249,580 common shares were 68c per share for the first six months in 1938.

FLORIDA PORTLAND CEMENT CO., Chicago, Ill., had net sales of $1,333,403 for the year ended September 30, 1938. For the 12 months ended September 30, 1937, sales totaled $1,151,880.

ALBERENE STONE CORP. OF VIRGINIA, New York, N. Y., reports a net income of $7,890 for the nine months ended September 30, 1938 as compared with $80,497 for the same period in 1937. Net sales for the first nine months in 1938 totaled $365,460. This compares with $479,936 for the same period in 1937.

PEERLESS CEMENT CORP., Detroit, Mich., reports a net profit of $60,644 for the quarter ended September 30, 1938. For the nine months there was a deficit of $15,220 as the first quarter showed a deficit of $71,798, and the second quarter a deficit of $4,066.

NATIONAL GYPSUM CO., Buffalo, N. Y., filed November 7 with the Securities and Exchange Commission a registration statement covering 60,000 shares of no par value $4.50 convertible cumulative preferred stock and an unannounced number of shares of $1 par value common stock. Employes were to be offered 100,000 shares of common stock under a "gold stock purchase plan". The balance of the shares are to be reserved for conversion of the preferred stock. Net proceeds from the sale of preferred stock are to be used for the retirement of the entire issue of $100 par value 7 percent cumulative first preferred stock, the entire issue of $20 par value 5 percent second preferred stock, and approximately $900,000 for construction and equipping of a unit for the manufacture of gypsum boards at the company's plant in New York City.

The new preferred stock will be redeemable on 30 days' notice at $105 through November 30, 1943, and at $103 thereafter plus accrued dividends.

MOULDING-BROWNELL CORP., Chicago, Ill., an affiliate of the Construction Materials Corp., is to be reorganized under the Corporate Bankruptcy Act. The plan, which has been presented to the courts, provides for conveyance of the company's property to a new company, all the common stock of which would be issued to Material Service Corp., in consideration of an agreement of Material Service providing, among other things, for payment in cash of certain claims allowed by the court, including the payment up to $700,000 of claims allowed, including reorganization fees, taxes and assessments, a $300,000 5 percent loan dated February 11, 1936 from the RFC and other liens and allowed claims. The plan also provides for payment to certain general creditors of $80,000 cash and $320,000 in preferred stock in full discharge of their claims. The preferred would be issued in two series: namely, class A preferred not exceeding $134,400 and class B preferred not exceeding $185,600.

CALIFORNIA ART TILE CORP., Los Angeles, Calif., has declared a dividend of 25c a share on class A accumulations, payable December 1 to stock of record November 25. The current payment leaves arrearages of $10.41 a share. During the fiscal year ended September 30, the company paid a total of 75c a share on accumulations.

SCHUMACHER WALL BOARD CORP., Los Angeles, Calif., reports a net profit of $40,001 after depreciation, amortization and provision for income taxes, equal to $1.36 a share on 29,410 shares of $2 cumulative preferred on which accumulated dividends are $9 a share. It is said that extended use of dry wall construction in residential building, attributed to higher costs of wet plaster, is having a beneficial effect on this company's earnings.

CAROLINA TALC CO., Murphy, N. C., has sunk a prospecting shaft on the Columbia Marble Co. property near Marble, N. C. J. W. Bailey, superintendent of the talc firm, has stated that the shaft has been sunk about 30 ft. and that there are indications of a good grade of talc.

New York Crushed Stone Meeting

NEW YORK STATE CRUSHED STONE ASSOCIATION, INC., met at the Commodore Hotel, New York City, November 17 to discuss sales promotion efforts and other proposals which will in the future affect crushed stone production in the state. The meeting was a lively one, with plenty of discussion from the floor, and the attendance from all parts of the state exceeded expectations.

Considerable discussion was devoted to a report on proposed specification changes affecting New York State Division of Highways type 3 bituminous concrete, which are designed for definiteness in the control of the product. The changes would require specific gradings of material and would allow a greater tolerance in the percentage of material passing the finest sieve. This subject was presented as a committee progress report of a study now being made. The meeting passed a resolution unanimously signifying a desire on the part of its members to provide suitable mechanical sieving devices at their plants for control purposes should the state request this action.

A. T. Goldbeck, engineering director of the National Crushed Stone Association, briefly mentioned some of the studies being pursued by the engineering department in the Washington laboratory, among them being the effect of various added percentages of limestone dust on the disintegration of concrete and stone sand. J. R. Boyd, executive secretary of the National Crushed Stone Association, commented upon the recently-enacted Wage-Hour Law.

A special study committee reported on "Better-Safer Highways League," an interesting plan which is being tried out in Dutchess County, New York. Briefly, the plan consists of an attempt being made, through the public, to promote better and safer highways in Dutchess County. Started by petroleum dealers and supported by other interested groups, in three weeks about 1100 persons were signed as members of the League. Dealers who come in daily contact with automobile drivers and the local Boy Scout organization were enlisted to sign up members who were in sympathy with the League objectives.

Objectives, as stated on the membership cards and which were given widespread newspaper publicity, are broadly: safer highways, the construction of grade separations, the removal of highway hazards, the progressive improvement of existing roads and the development of lesser-traveled roads, and uniform rules for the control of pedestrian traffic.

At the meeting, members gave considerable thought to the effect which such a program, in Dutchess County, and if expanded to embrace other important counties, might have in influencing the state legislature and making more funds available for road construction. Consensus of opinion at the meeting was that the plan has good possibilities and is to be watched with interest to determine what effect public opinion will have in improving highways in Dutchess County. Several members expressed an interest in supporting the movement in other counties, should the experiment bring desired results.

A third committee reported on the status of the proposed state code to control dust in the stone crushing industry. The committee, in its opinion, was coöperative in its attitude toward improving working and health conditions, but recommended that certain steps be followed in introducing dust-collecting and other preventive measures.

It was felt that should the code be adopted it should be done gradually, since the expense would work a hardship on the industry.

Discuss Wage and Hour Laws

ILLINOIS SAND AND GRAVEL ASSOCIATION held a special meeting in Chicago on November 9 to hear the latest on the Walsh-Healey act and the Federal wage and hour law, from V. P. Ahearn, executive secretary, National Sand and Gravel Association. R. E. Weaver, president, presided and 20 members and guests were present.

Secretary Ahearn explained the method employed to set up prevailing minimum wages under the Walsh-Healey act. For this purpose the crushed stone and slag industries have been grouped with sand and gravel. Something between $14,000,000 and $15,000,000 worth of these materials have been subject to the law, since it was enacted. Employes of producers furnishing this material have been subject to the working hours provision of the law, but until now "prevailing minimum wages" had not been established. These are established by the U. S. Department of Labor, after consultation with an industry committee and a labor committee, working as a unit. Secretary Ahearn said questionnaires would be sent all producers and he urged that they be filled out promptly and returned.

Wage and Hour Law

Secretary Ahearn discussed at length various issues raised by the Federal wage and hour law and gave answers so far as possible under existing rulings. The sand and gravel industry is attempting to obtain a classification as a seasonal industry, and in the northern parts of the country the arguments are valid. The word "industry" in the act has been construed broadly to mean a single operation.

As to what is "interstate commerce," Mr. Ahearn thought that even where products changed hands at the plant, but afterward moved across state lines, the plant would be held as producing for interstate commerce. He thought the primary purpose of the law was to compel "share-the-work," rather than to raise wages through payment of overtime.

The following were present:

Producers

E. W. Boynton, Northern Gravel Co., Muscatine, Iowa.

O. J. Ellingen, H. D. Conkey & Co., Mendota, Ill.

J. L. Fay, Moulding-Brownell Co., Chicago, Ill.

C. E. Fraebner, Northern Gravel Co., Muscatine, Iowa.

N. R. Halliday, Halliday Sand Co., Cairo, Ill.

G. M. Hatfield, Materials Service Corp., Chicago, Ill.

E. H. King, McGrath Sand & Gravel Co., Lincoln, Ill.

Frank E. Lane, Janesville Sand and Gravel Co., Janesville, Wis.

T. E. McGrath, McGrath Sand and Gravel Co., Lincoln, Ill.

J. D. Mollendorf, Atwood-Davis Sand Co., South Beloit, Wis.

Chas. J. O'Loughlin, Consumers Co., Chicago, Ill.

Geo. W. Renwick, Chicago Gravel Co., Chicago, Ill.

John Seeman, Moulding-Brownell Co., Chicago, Ill.

W. G. Spicer, Spicer Gravel Co., Marseilles, Ill.

E. Guy Sutton, Neal Gravel Co., Mattoon, Ill.

R. E. Weaver, Lincoln Sand and Gravel Co., Lincoln, Ill.

W. H. Wyckoff, Merom Gravel Co., Merom, Ind.

Guests

V. P. Ahearn, National Sand and Gravel Association, Washington, D. C.

S. A. Phillips, *Pit and Quarry*, Chicago.

Nathan C. Rockwood, ROCK PRODUCTS, Chicago.

Stanton Walker, National Sand and Gravel Association, Washington, D. C.

Lime Company Celebrates Safety Record

AMERICAN LIME AND STONE Co. employes of the Bellefonte, Penn., plant recently attended a dinner at the Nittany Country Club, celebrating the completion of two years' operation without a single lost-time accident. President Charles Warner congratulated the men on their splendid record. During the two years ending October 10, 1938, there were only 26 reportable injuries, in which no time was lost. During this period over 527,000 man-hours were worked. Short talks were also given by Frederick Warner, plant superintendent, and Samuel M. Shallcross, general manager of the company. Calvin Purnell, in charge of safety at the local plants since October 1, was chairman of the dinner committee.

Sand Company Makes Improvements

THE FORD SILICA SAND Co., near Four Mile, just south of Jacksonville, Fla., has installed new machinery to increase its capacity to 100 tons of sand per day. This company was started in December, 1937, by two brothers, R. L. and A. B. Ford. It also handles crushed stone and building dimension stone.

Lime Standards Approved

THE AMERICAN SOCIETY FOR TESTING MATERIALS has approved the proposals of Committee C-7 and new tentative specifications are being issued under the designation C 141—38 T. Two types of lime are covered, namely, high calcium lime (containing not more than 5 percent magnesium oxide) and magnesium lime (containing more than 5 percent magnesium oxide). Hydraulic lime is defined in the specifications as "the hydrated dry cementitious product obtained by calcining a limestone containing silica and alumina to a temperature short of incipient fusion so as to form sufficient free lime (CaO) to permit hydration and at the same time leaving unhydrated sufficient calcium silicates to give the dry powder, meeting the requirements herein stated, its hydraulic properties." It is indicated that this lime may be used for scratch or brown coat of plaster, for stucco, for mortar, and as sole cementitious material in concrete, or in portland cement concrete either as blend, amendment, or admixture.

Natural Gas-Fired Lime Kilns for Canada

THE GYPSUM LIME AND ALABASTINE, CANADA, LTD., with headquarters in Toronto, will install a new, modern three-kiln lime plant arranged to be fired by natural gas. Kilns are of Azbe design, and the installation is under the direction of J. H. Robinson, general superintendent of lime plants for the Gypsum, Lime and Alabastine company. These kilns are believed to be the first Canadian kilns to be fired with natural gas and will also be of greater capacity than any other lime kilns in Canada.

UNITED STATES GYPSUM Co., Chicago, has let contracts through George A. Fuller Co., contractor, for the construction of its Jacksonville, Fla., plant. Among the contracts placed were the following: Parkhill Dredging Co., Inc., dredging; Capitol Concrete Co., ready-mixed concrete; Truscon Steel Co., reinforcing steel; Kinnear Manufacturing Co., rolling steel doors.

CERTAINTEED PRODUCTS CORP., New York, N. Y., has announced that production will be resumed at its Grand Rapids, Mich., plant where gypsum wall board and lath are made. The plant will be reconstructed and new machinery installed. This decision, it is said, has been made in expectation of a nationwide pickup in home building.

UNITED STATES GYPSUM Co.'s lime plant at Evans, Wash., has adopted a 40-hour week, according to a recent report.

Midwest Agricultural Limestone Institute

THE ANNUAL FALL MEETINGS of the Midwest Agricultural Limestone Institute at French Lick Springs, Ind., appear likely to entirely justify its name. Their purpose, as conceived and developed by President E. J. Krause, is to bring together not only producers but educators and agricultural agents and authorities to discuss ways and means of increasing the use of agricultural limestone.

The objective is common, even if the motives may be different. Frankly recognizing this, these annual conferences have been productive of much good to all concerned, not by any means omitting the farmer, who is really the chief beneficiary.

At the meeting held October 28, producers and agricultural authorities were present from the states of Illinois and Indiana, where approximately 2,000,000 tons of limestone were used in 1938. Truckers continue to be an important factor in the sale and distribution of this agricultural limestone.

All of the officers of the Institute were reëlected. They are: E. J. Krause, St. Louis, Mo., president; J. L. Fay, Chicago, Ill., vice-president; J. R. Bent, Chicago, Ill., secretary-treasurer.

Lime

ON FRIDAY, November 4, the National Lime Association sponsored a luncheon at the Hotel Mayflower, Washington, D. C. After the luncheon Professor Voss delivered his lecture, entitled "Why Masonry Walls Leak". Two hundred and eighty persons were in attendance including local architects, engineers, builders, and key men from the various governmental departments interested in mortar specifications.

Power Exposition

DURING THE WEEK of December 5 to 10, 1938, the National Exposition of Power and Mechanical Engineering will hold its thirteenth annual show in New York City. Dynamic and comprehensive displays designed to give the visitor the latest information in the shortest possible time will present new developments in power generation and mechanical engineering equipment.

Government Asks for Bids on Gravel and Rip-Rap Stone

THE UNITED STATES ENGINEERS OFFICE, Vicksburg, Miss., will receive bids on December 5 for furnishing gravel only and for placing gravel and rip-rap stone for construction of upstream slope protection for Sardis Dam. This work will require 98,500 cu. yd. of gravel blankets; 16,000 solid cu. yd. of 18-in. dumped rip-rap; 155,000 solid cu. yd. 36-in. dumped rip-rap; 4,000 solid cu. yd. stone for dumped rip-rap in stockpiles.

Colonial Operates Largest Diesel Fleet

COLONIAL SAND & STONE CO., New York, N. Y., will operate probably the largest fleet of Diesel-powered trucks for industrial use in the country when it completes its program of replacing gasoline engines with the new units and receives all the new trucks on order. In August, the company ordered 112 Cummins Diesel engines, and in September the order was boosted to 128, 66 to be installed in new Mack trucks and 62 to be used for replacement in old chassis. In October an additional 43 Diesels were ordered for replacement jobs, making a total of 171.

Ohio Ready-Mixed Concrete Trucks Must Pay Tax

ON NOVEMBER 2, the county court of appeals in Columbus, Ohio, held that a license tax must be paid on portable cement mixing machines although the equipment is used in construction work and is not designed for or employed in general highway transportation. The ruling was made in a mandamus suit brought by Chas. K. Yontz to compel the state registrar of motor vehicles to collect the motor vehicle tax. It is said that more than 400 ready-mixed concrete trucks are involved.

Norfolk Has New Sand and Gravel Enterprise

SOUTHERN MATERIALS CORP., Norfolk, Va., is the name of a recently organized sand and gravel and ready-mixed concrete company which is reported to have an investment of $250,000. The company's plant is located on East Water street at the Norfolk and Western Railway. Property also has been leased at the Southgate Terminal in Portsmouth, Va., to serve the Portsmouth and Norfolk Navy Yard sections. About 150 acres of land has been acquired on the James river, near Curles Neck, where the gravel pits are located. Three large sand and gravel dredges are in use, and a fleet of ready-mixed concrete trucks are operated. The company is under the management of H. B. Roberts, president. James P. Sadler is manager of the Norfolk plant, and H. M. Burris has charge of the Portsmouth offices.

JOPLIN, MO.: The Independent Gravel Co. was awarded a contract by the city council for resurfacing streets with asphaltic concrete on a bid of 65c a square yard

Government Quarry Shuts Down

THE FEDERAL GOVERNMENT-OPERATED quarry at Snake Butte, 14 miles south of Harlem, Mont., shut down for the winter on November 10, 1938. Stone quarried for Fort Peck dam during 1938 totaled 246,000 cu. yd.

DOBLASUE LIME AND MINING CORP., Republic, Wash., lost a rock bunker in a recent fire which did not damage the plant proper. The flames which destroyed the bunker apparently originated from a fire that was made to dry out the kiln before starting up operation of the plant. Production will soon be resumed. Pat Noble is operating the plant and is associated in the business with his father, an attorney in Republic, Wash.

KENTUCKY ROCK ASPHALT CO., INC., Louisville, Ky., has resumed operations at its Kyrock, Ky., plant, which had been shut down since September. During the suspension of operations, new crushers, screens, and other equipment have been installed.

MT. VERNON SAND & GRAVEL CO., Mt. Vernon, Ohio, with plant at Fredericktown, was recently taken over by the France Stone Co., Toledo, Ohio. R. D. Dwyer is the superintendent in charge. A new office has been built at the plant, and other changes and repairs will be made. The gravel deposit is worked with a drag scraper.

JOHNS-MANVILLE CORP., New York, N. Y., has announced that three new plants costing about $4,000,000 will be in operation early in 1939. The plants are at Jarratt, Va., Richmond, Ind., and Watson, Calif.

OCTOBER SHIPMENTS of phosphate rock in the Tennessee field are reported to be less in volume than September. However, the indications for the remainder of 1938 still seem to justify expectation that the volume for the year will be up to 1937, at least in the ground rock lines.

CALDWELL STONE CO., Danville, Ky., recently purchased a 262½ hp. generator set, rated at 175 kw., for the power plant.

GENESSEE STONE PRODUCTS CO., Batavia, N. Y., has installed a 675 hp., 450 kw. Buckeye generator set in its power plant.

Beg Your Pardon!

IN THE REPORT of the Knoxville, Tenn., meeting of the Industrial Minerals Division of the American Institute of Mining Engineers, the ceramics laboratory at the Norris Dam was referred to as a T.V.A. laboratory. It is one of the U. S. Bureau of Mines laboratories.

Traffic and Transportation

PROPOSED RATE CHANGES—*The following are the latest proposed changes in freight rates up to and including the week of November 5:*

Central

55695. Establish on **fuller's earth,** C. L., Olmstead, Ill., to Mt. Pleasant, Mich., 700c, min. wt. 40,000 lb. and 560c per net ton, min. wt. 70,000 lb.

55743. Cancel carload rates on **rock,** viz.: Phosphate, crude, lump, in bulk or crude (not acidulated) in bags, barrels or bulk, min. wt. 44,800 lb., applying on traffic originating south of Ohio river, Evansville, Ind., to various consuming pts. in Ill., Ind. and a few pts. in Ia.—Clinton, Burlington, etc., published in C. & E. I. Frt. Trf. 230C, Items 1750 through 1781 and other individual lines' tariffs, Classn. basis to apply.

Note—When a shipper orders a car of the above mentioned marked capacities or greater, and the carrier is unable to furnish car ordered and furnishes a car of greater capacity than that ordered, the minimum weight for the car furnished will be that which would have obtained had the car ordered been furnished and used.

55846. Cancel Item 23590-B, Sup. 46 to C. F. A. L. Trf. 218-K, publishing rates on **fuller's earth,** min. wt. 40,000 lb., from Groups 6600 to 6615, to Newport News and Norfolk, Va., for export to foreign countries, and similar rates in individual lines' tariffs. Classn. basis to apply.

55925. Establish on **slag,** commercial, crushed (the product of iron and steel furnaces), in bulk, in open top equipment, C. L., Antrim, Mich., to Richmond, Ind., 187c per net ton.

55929. To establish on **refuse crushed stone** (quarry waste), Milltown, Ind., to Watson, Ind., 60c net ton.

55979. To cancel rate of 94c per ton on **cinders, clay or shale,** C. L., Cleveland, O., to Concord, O., Classn. basis to apply.

56000. To cancel rates on commodities shown below, published in L. & N. R. R. Trf. G. F. O. 83-E and other tariffs containing the same rates. Item 2500-C—**Agricultural stone** (ground limestone), Mt. Vernon, Ill., to Evansville, Ind. Item 2585-A—**Lime,** Mt Vernon, Ind., to Evansville, Ind. Item 2525-A—**Agricultural stone** (ground limestone), Mt. Vernon, Ind., to Henderson, Ky. Classn. basis to apply.

56020 Cancel proportional rates on **lime,** common, hydrated, quick or slaked; also **lime,** agricultural and fluxing, C. L., published in C. F. A. L. Trf. 516-F, E. St. Louis, Ill., and Hannibal, Mo., to points in C. F. A. territory, through rates now in effect from origin territory involved to destinations in tariff to apply in lieu thereof.

56024. Cancel present rates on **sand,** C. L., Ottawa, Ill., dist. to Schuyler, Va., published in Item 10718-B, Sup. 53, to C. F. A. L. Trf. 218-K, combination rate from Esmont, Va., to apply in lieu thereof.

56036. Establish on **crushed granite,** in bags, L. C. L., between pts. in C. F. A. territory, and from pts. in C. F. A. territory to pts. east of [illegible], 5th class rating.

56048. Establish on **stone,** fluxing, furnace or foundry, melting or refractory, (unburned) in bulk, in open top cars, C. L., Hillsville, Shaw Jct. and Walford, Penn., to Geneva, Ohio, [illegible]c per gross ton, via P. & L. E. R. R., Youngstown (N. Y. C. Jct.), Ohio, N. Y. C. R. R.

56106. Establish on (a) **sand,** naturally bonded moulding, in all kinds of equipment, C. L.; **sand** (except naturally bonded moulding; ground or pulverized sand), in closed equipment, C. L.; (b) **sand,** ground or pulverized, in all kinds of equipment, C. L.; (c) **sand** (except naturally bonded moulding; ground or pulverized sand), in open top equipment, C. L.; points in the so-called Evansville group to points in Wis. and Mich. located outside Zone C and I. F. A. territory; also to additional points in Wis. and Mich. located in Zone C and I. F. A. territory.

(Rates in Cents Per Net Ton)

To (Representative)	Prop. Rates Description A	B	C	Pres. Rates
Antigo, Wis.	352	387	352	436
Ashland, Wis.	396	436	396	475
Bessemer, Mich.	385	424	385	475
Berlin, Wis.	319	351	319	424
Chippewa Falls, Wis.	374	414	374	436
Eau Claire, Wis.	385	424	385	436
Escanaba, Mich.	374	414	374	436
East Winona, Wis.	352	387	352	424
Iron River, Wis.	407	448	407	475
Ironwood, Mich.	385	424	385	475
La Crosse, Wis.	341	375	341	424
Merrillan, Wis.	352	387	352	424
Prairie Du Chien, Wis.	319	351	319	424
Ripon, Wis.	319	351	319	424
Rhinelander, Wis.	363	399	363	436
Sparta, Wis.	341	375	341	424
Stevens Point, Wis.	352	387	352	424
Superior, Wis.	407	445	407	475
Waupaca, Wis.	341	375	341	424
Wausau, Wis.	352	387	352	424
Wis. Rapids, Wis.	352	387	352	424
Wyeville, Wis.	341	375	341	424
Marquette, Mich.	385	424	385	475

To Points in Wisconsin and Michigan Located in Zone C and I. F. A.

To (Representative)	Prop. Rates Description A	B	C	Pres. Rates
Algoma, Wis.	341	375	341	424
Chilton, Wis.	319	351	319	330
Janesville, Wis.	286	315	286	397
Kewaunee, Wis.	341	375	341	424
Manitowoc, Wis.	319	351	319	319
Menominee, Mich.	352	387	352	436
Monroe, Wis.	297	327	297	308
Plymouth, Wis.	308	339	308	308
Sturgeon Bay, Wis.	352	387	352	424
Watertown, Wis.	308	339	308	308

56058. Cancel Item 200 of E. J. & E. Ry. Trf. 131-B, publishing rates on **rock, gypsum,** crushed (not ground), or run of mine, C. L., E. Chicago, Ind., to Limedale, Mitchell, Stroh and Speeds, Ind., permitting to apply in lieu thereof Chicago, Ill., rate of 17c, published in C. I. & L. Ry. Trf. 1065-F, and C. C. C. & St. L. Ry. Trf. 1958, which rate is applicable from E. Chicago, Ind., under application of switching tariff.

56060. Establish on **sand,** all kinds, and **gravel,** in open top cars, C. L., from Holmesville, Ohio, to Akron, 88c; Alliance, 99c; Cincinnati, 187c; Cleveland, 110c; Dayton, 149c; Delaware, 116c; Fostoria, 127c; Lima, 138c; Marion, 116c; Piqua, 149c; Springfield, 138c; Toledo, 138c; Wilmington, 149c, and Youngstown, Ohio, 116c per net ton., via established routes.

56061. Establish on **sand,** all kinds, and **gravel,** in open top cars, C. L., Negley, Ohio, to E. Rochester, 94c; Kensington, Summitville, 99c; Salineville, New Salisbury, Irondale, 105c, and Hammondsville, Ohio, 110c per net ton.

56160. Establish on **sand,** all kinds, or **gravel,** in open top equipment, C. L., Phalanx, Ohio, to Dundee, Ohio, 105c per net ton.

56176. Establish on **slag,** crude, granulated, crushed or commercial (the product of iron and steel furnaces), in bulk, in open top equipment, C. L., South Chicago, Ill., to Linton, Ind., 154c per net ton.

Trunk

36953 (Sup. 1) (increase). To cancel commodity rates on **slate,** curbing, flagging or paving, C. L., from various points on the Lehigh Valley Railroad to points on the B. & A. R. R., B. & M. R. R., N. Y. N. H. & H. R. R., Reading Co. and Southern Ry., published in L. V. R. R. Tariff I. C. C. C-8623. Reason—No present or prospective movement.

37095 (increase). To cancel commodity rates on **dry mortar,** C. L., from Dover Plains, N. Y., to Norfolk and Raymondville, N. Y., $5.13, Chase Mills and Waddington, N. Y., $5.54 per net ton, published in N. Y. C. R. R. Tariff I. C. C. NYC No. 16813, Item 1150-B. Reason: No present or prospective movement.

37100. To amend Agent Curlett's Tariff I. C. C. A-573 providing for rates on **limestone and stone dust** as described in and from origin points enumerated in Item 10790 thereof taking origin group letters A to N, inclusive, to M. St. P. & S. S. M. Ry. stations 50—Feehanville, 60—Wheeling, 65—Aptakisic, 70—Prairie View and 75—Leithton, Ill., rates as follows:

From	Rate	From	Rate
Group A	$4.24	Group H	$3.91
Group B	4.35	Group J	4.68
Group C	4.46	Group K	3.91
Group D	4.79	Group L	4.68
Group E	4.46	Group M	5.01
Group F	3.91	Group N	4.46
Group G	4.46		

And to correct rates shown to M. St. P. & S. S. M. Ry. stations in Item 11010 taking index numbers 80 to 170, inclusive, and 210 to 220, inclusive, as follows:

From	Pres.	Prop.
Group A	$4.24	$4.46
Group B	4.35	4.57
Group C	4.35	4.79
Group D	4.68	5.01
Group E	4.35	4.68
Group F	3.91	4.24
Group G	4.35	4.68
Group H	3.91	4.02
Group J	4.57	4.90
Group K	3.91	4.13
Group L	4.57	4.90
Group M	4.90	5.12
Group N	4.35	4.68

Reason—To correct tariff error.

37119. **Limestone,** ground or pulverized, in straight or mixed C. L., min. wt. 60,000 lb., from West Apollo, Penn., to points of destination in Penn., rates ranging from 33c to $1.43 per net ton. Reason: Based on I. C. C. Docket 23068 single line scale plus Ex Parte 123 increase.

Sup. 3 to 37074. Crushed or ground **slate** (roofing granules), C. L., min. wt. 50,000 lb., to Portneuf, Que., from Whiteford, Cardiff, Md., Delta and Slate Hill, Penn., 84c per 100 lb., in lieu of present sixth class rates.

37165 (increases and reductions). **Sand,** naturally bonded molding, in open top or closed cars, C. L. (See Note 3), from D. & H.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

R. R. Station 61, South Schenectady, N. Y., to 102, Gansevoort, N. Y., inclusive; to establish Sherbrooke, Quebec, rate of $3.47 per net ton and to cancel rates now applicable to Lennoxville, Quebec; and it is further proposed to cancel commodity rate of 25c per 100 lb. to Quebec Central Ry. Stations 10, Beebe Jct., Vt., to 145, Capelton, Que., and 265, Derby Line, Vt., to 275, Stanstead, Que., because of obsolescence.

Sup. 4 to 37074. **Stone chips** or **granules** (roofing granules), C. L., min. wt. 50,000 lb. to Portneuf, Que., from Muncy, Penn., 32c per 100 lb.

37181. **Slag,** C. L. (See Note 3), from Wharton, Lake Junction, N. J., Bethlehem, Catasauqua, Hokendauqua, Palmerton District, Penn., to Lennoxville and Sherbrooke, Que., 30c per 100 lb. Reason—This basis now applicable via some routes.

37184. **Limestone,** crude, fluxing, foundry and furnace, when loaded in bulk in open top equipment, C. L. (See Note 3), to Lorain, Ohio, from B. & O. R. R. stations Martinsburg, Engle, W. Va., Grove, Md., Stephens City, Strasburg Jct., Capon Road, Va., W. Md. Ry. stations Cavetown, Md., Bittinger, Thomasville, York, Penn., and P. R. R. Station Inwood, W. Va., rate $2.20 per gross ton, in lieu of present class rates. Reason—Account comparable with rates to other destinations.

37211. **Granules, roofing** (consisting of crushed slate or crushed stone or made from clay or from silica sand or crushed slag), C. L., min. wt. 80,000 lb., etc., from Bound Brook, N. J., to Niagara Falls and North Tonawanda, N. Y., $3.61 per net ton, in lieu of present class rate. Reason: Account of comparable rates from other origins.

Southern

17639. **Phosphate rock and phosphatic limestone,** C. L. Extend expiration date in connection with rates published in L. & N. I. C. C. A-16079, from L. & N. and N. C. & St. L. Ry. stations in Mt. Pleasant-Centreville district to lake ports in C. F. A. territory, also Joliet and Lansing, Mich., until Dec. 31, 1939.

17640. **Clay,** crude, **silica,** C. L. Cancel, as obsolete, rates published in Item 3231-A, S. F. T. B. Tariff 705-B, from Big Sandy and Benton Cut, Tenn., to New Orleans, La., Mobile, Ala., and Panama City, Fla., for export. Class or combination rates to apply.

17694. **Crushed stone,** C. L. Cancel, as obsolete, rate of 77c net ton from Dombey, Ky., to Fort Knox, Ky. Normal rates to apply.

Amdt. 1 to 15793. This submittal included in Docket 909, assigned for Oct. 18, 1937, hearing, amended to suggest: **Lime,** C. L. Establish 649c C. L. Min. 30,000 lb. and 519c net ton C. L. min. 50,000 lb., St. Louis, Mosher and Ste. Genevieve, Mo., to Fernandina, Fla.

17790. **Ground limestone,** C. L. Establish from Dolcito, Ala., to Ruston, 256c; Arcadia, 267c; Ringgold, 278c, and Shreveport, La., 284c net ton.

17859. **Crushed stone** or granite, C. L. Establish 348c net ton, Danville, Gretna, Va., Asheville, Durham, Greensboro, Henderson, Mt. Airy, Oxford, Raleigh, Salisbury and Winston-Salem, N. C., to East St. Louis, Ill., for beyond.

17763-1. **Granite** or **stone,** C. L. Establish 19c cwt. from Lithonia, Conyers, Redan and Stone Mountain, Ga., to Panama City, Fla.

Western

E-41-263. **Sand,** viz.: Blast, core, engine, filter, fire, furnace, foundry, glass, grinding, polishing, moulding or silica, min. wt. per Item 3475-A, Sup. 55, WTL Tariff 50-P, I. C. C. A-2723, from Ottawa and Wedron, Ill., to Newton, Ia. Rates, present, 13c per 100 lb. Proposed 12c per 100 lb.

E-41-264. **Sand,** glass, moulding or silica, C. L., min. wt., no change, from Ottawa and Utica, Ill., to Fort Dodge, Gypsum, Kalo and Lehigh, Ia. Rates, present, 13c per 100 lb. Proposed, 12c per 100 lb.

E-41-267. **Stone,** crushed, other than crushed or ground limestone, in mixed carloads with crushed or ground limestone, min. wt. not involved, from Weeping Water, Neb., to stations in W. T. L. territory, Rule: Present—Mixture not permitted. Proposed—To permit crushed stone, other than crushed or ground limestone to move in mixed carloads with crushed or ground limestone, at the crushed or ground limestone rates.

E-41-268. **Sand,** common, foundry, glass, molding or silica (including ground silica), C. L., from Big Bend, So. Dak. (Rates in cents per ton of 2,000 lb.

To	Pres.	Prop.
Omaha, Neb.	700	400
Kansas City, Mo.	810	466
Sioux City, Ia.	640	400
Lincoln, Neb.	720	400
Denver, Colo.	640	366
Chicago, Ill.	909	514

Min. wt.: Present 40,000 lb. Proposed—(See Note 3), but not less than 40,000 lb.

E-41-269. **Sand,** silica, C. L., min. wt. 50,000 lb., the same as presently applicable to other points in Illinois in M-K-T Tariff 3704-N, I. C. C. 1140, from Klondike, Mo., to Ottawa, Ill. Rates: Present—300c per net ton (See Note 2). Proposed—249c per ton of 2000 lb. in box cars, 216c per ton of 2000 lb. in open cars. (Not subject to Ex Parte 123 increase.)

E-43-66. **Stone,** natural, other than bituminous asphalt rock, C. L., from Salt Lake City, Utah, to Chicago, Ill. Rates and min. Wts.: Present 62c per 100 lb., min. wt. 40,000 lb. Proposed—50c per 100 lb., min. wt. 80,000 lb.

E-54-20. **Silica,** crushed or ground; **tripoli,** crushed, ground or pulverized, C. L., min. wt. 80,000 lb., from Baxter Springs, Kan., to Washington D. C. Rates: Present—47c per 100 lb. Proposed—39c per 100 lb.

Illinois

613 Pt. 1. **Crushed stone,** C. L. (See Note 3), but not less than 40,000 lb. will apply. Proposed rates. From East St. Louis to Illinois points on C. & I. M. Ry.: Peoria, Pekin, Crescent, Pit No. 5, Powerton, Parkland, all 125c; Manito, Forest City, Bishop, Topeka, Eckard, Havana, Kelsey, Long Branch, Conover, Kilbourne, Oakford, Atterbury, Hill Top, all 111c.

From Krause to points on C. & I. M. Ry.: Peoria, Pekin, Crescent, Pit No. 5, Powerton, Parkland, all 136c; Manito, Forest City, Bishop, Topeka, Eckard, Havana, Kelsey, Long Branch, Conover, Kilbourne, Oakford, Atterbury, Hill Top, all 122c.

From Valmeyer to points on C. & I. M. Ry.: Peoria, Pekin, Crescent, Pit No. 5, Powerton, Parkland, all 142c; Manito, Forest City, Bishop, Topeka, Eckard, Havana, Kelsey, Long Branch, Conover, Kilbourne, Oakford, Atterbury, Hill Top, all 128c; Petersburg, Tice, Athens, Barr, Cantrall, Andrew, Water Works, Shops, all from 131c to 128c, and Petersburg (Alton R. R.) from 131c to 128c.

8198-1. **Agricultural limestone,** C. L., from Joliet to Havana, Ill. Present, 121c per ton of 2000 lb. Proposed, 110c per ton of 2000 lb.

6624. **Sand** (other than bank, glass, moulding, silica, blast, core, engine, filtering, fire or furnace, foundry, grinding or polishing or loam sand), **gravel, crushed stone, slag** (See Note 3), from Joliet, Plainfield, Aurora, Munger, Spaulding, Ill., to Buffington, East Chicago, Gary, Hammond, Indiana Harbor, Stockton, Whiting and Whiting (Lake Front), Ind., South Chicago and South Chicago (98th St.), Ill. Present—72c ton. Proposed rate from Aurora, Munger, Plainfield and Spaulding to apply only on sand (as described) and gravel, 50c ton. Proposed rate to apply only via single line route of E. J. & E. Ry., appropriate fourth section application to be filed to maintain higher rates from, to and between intermediate points, 50c ton. Proposed rate to apply as a temporary rate for 18 months from date established, 50c ton.

6953-A. **Agricultural limestone,** C. L. (See Note 3), but not less than 60,000 lb.

From Krause, Ill.

To	Pres.	Prop.
C. & N. W. Ry. station, Benld, Ill.	95	80
C. & N. W. Ry. stations, Henderson, Siding No. 3, Womac, Standard City, Schaper, Girard, Virden	117	108

From Valmeyer, Ill.

To	Pres.	Prop.
Alton R. R. stations, Anderson, Nilwood, Green Ridge, Girard, Virden	117	113
C. B. & Q. stations, Virden, Girard	*	113
Ill. Term. stations, Alton Siding, Sheeps, Anderson, Coopers, Nilwood, Girard, Monroe, Virden	117	113
C. & N. W. Ry. station, Benld, Ill.	103	86
C. & N. W. Ry. stations, Henderson, Siding No. 3, Schaper, Girard, Virden	122	113

*Combination.

8612. **Crushed stone,** coated with oil, tar or asphaltum, C. L. (See Note 3). Proposed, from Anna, Ill.:

To following Illinois points: Lawrenceville, $2.29, Mt. Carmel, $2.16, Fairfield, $1.90, McLeansboro, $1.78, Shawneetown, $1.78, Nashville, $1.65.

Southwestern

14746. **Rock,** bituminous, Iantha, Mo., to East St. Louis (applicable on traffic destined to points east of the Mississippi River). To reestablish the following rate formerly provided in Item 3760 of Western Trunk Lines' Freight Tariff 18-O, I. C. C. A-2826, which expired with June 30, 1938, to expire six months after date on which reestablished. After date of expiration rate now provided in Item 3760 referenced "(1)" will apply:

From Iantha, Mo., to East St. Louis, Ill., (on traffic destined to points east of the Mississippi River). Rate in cents per ton of 2000 lb., 211.

14766. **Superphosphate,** Memphis, Tenn., to North Little Rock, Ark. To publish a specific commodity rate of $2.80 per ton on superphosphate (acid phosphate), not ammoniated, min. wt. 80,000 lb. per car, from Memphis, Tenn., to North Little Rock, Ark., to take care of a plant-to-plant movement.

14857. **Slag,** Birmingham, Ala., and group to Thibodaux, La. To establish rate of $2.67 per ton of 2000 lb. on slag (except ground open-hearth basic slag or basic phosphate slag), C. L. (See Note 3), from Birmingham, Ala., and Group as defined in Item 495 of S. W. L. Tariff 114G, to Thibodaux, La.

14943. **Slag,** Holt, Ala., to Thibodaux, La. To establish rate of $2.67 per ton of 2,000 lb. on slag (except ground open-hearth basic slag or basic phosphate slag), C. L. (See Note 3), from Holt, Ala., to Thibodaux.

15021. **Limestone,** Limedale Spur, Ark., to East St. Louis, Ill. To establish rate of 216c per net ton on ground limestone, carloads, min. wt. as provided in paragraph (b), Item 60, S. W. L. Tariff No. 162-M, from Limedale Spur, Ark., to East St. Louis, Ill.

15118. **Lime,** Dittlinger, Houston, Lime City, McNeil, Oglesby and Round Rock, Tex., to Augusta and Eldorado, Kan. Establish rates on lime from origins in Item 265-F, SWL Tariff 227-A, to Augusta and Eldorado, Column 1—30c, Column 2—24c, to apply via Santa Fe as destination line. Present, Column 1—32c, Column 2—26c, via Santa Fe, and 30 and 24c, respectively, via other lines.

THE INDUSTRY

New Incorporations

Jersey Sand & Gravel Corp., Vineland, N. J., has been incorporated with 2500 shares of no par value stock. Philip L. Lipman is agent.

Cement Shingle Corporation, Wilmington, Del., is the name of a new corporation with stock of $100,000. Incorporators are: Roswell M. Udall, William B. Crow and Elizabeth T. Crow.

Lake Charles Concrete Co. is the name of a new corporation in Lake Charles, La. It has a capital of $21,000. Pelham E. Mills is president and other officers, directors and stockholders are Fred Mills and Walter P. Mills.

Stone Products Co., Inc., Coffeyville, Kan., has been granted a charter with a capital stock of $10,000 divided into shares of $100 each. Incorporators are: D. E. Wollner, Gladys S. Wollner, J. E. Angleton and Myrtle Angleton. The company will quarry, mine and crush rock and sell and distribute it.

Millville Silica, Sand & Gravel Co., Port Elizabeth, N. J., has been incorporated with a capital stock of $125,000. Daniel Passarelli is agent.

Concrete Conduit Co., Ltd., Colton, Calif., has been granted a charter with a capital stock of $120,000. F. F. Bokern, Dallas, Tex., is agent.

Braden Quarries, Inc., Dover, Del., is the name of a new corporation with a capital stock of $575,000. L. E. Gray, L. H. Hermann and Walter Lenz are incorporators.

Providence Granite Co., Inc., Providence, R. I., has been incorporated by Antonetta Bernardo, Peter Bernardo and Eugene Bernardo with a capital stock of $100,000.

Kentucky Black Rock Asphalt Co., Chicago, Ill., has been granted a charter with a capital stock of 50,000 shares no par value. Incorporators are E. T. McGinty, L. A. Rosenthal and C. A. Murray.

Kirkpatrick Sand and Cement Co., 2906 N. 2nd Avenue, Birmingham, Ala., has been incorporated with a capital stock of $1600.

Mineralite Products Co., Knoxville, Tenn., is the name of a new company recently organized to manufacture rock wool. It will occupy the old Day-Evans foundry and iron works and will employ 40 men when it begins production. Directors are Jesse Bland, C. L. Dickason, Howard B. Smith, G. B. Bertram and L. C. Ely.

McDowell Stone Co., Blackwater, Mo., has been incorporated by R. Newton McDowell and Nina M. McDowell.

North Shore Sand & Gravel Corp., Queens, N. Y., has been granted a charter with 1200 shares of no par value stock.

Clinch Mountain Sand Corporation, Richlands, Va., with capital stock of $20,000, has had its charter amended to deal in sandstone, minerals and like products. R. Brittain, Jewel Ridge, Va., is president.

Colonial Rock Wool, Inc., Rockdale, West Stockbridge, Mass., has been incorporated with a capital stock of $65,000, of which 650 shares are valued at $100 each and 3300 are common with no par value. Incorporators are Thomas S. Ramsdell, president and clerk; Robert P. Worthley, treasurer; and Clarence G. Spencer et al.

Asbestos Cement Pipes, Inc., 15 Exchange Place, Jersey City, N. J., has been granted a charter with a capital stock of 20,000 no par value shares. T. Lea Perot, William C. Wright and R. B. Kennedy are incorporators.

Sand and Gravel Sales Co., 813 Jefferson Bldg., Peoria, Ill., has been incorporated by Timothy W. Swain, Thomas B. Kennedy and Mary F. Dore, with a capital stock of 500 shares par value common at $100 per share.

Manufacturers

Dart Truck Co., Kansas City, Mo., has announced the appointment of Bruce P. Smith as vice-president in charge of sales with headquarters at 520 N. Michigan Ave., Chicago. Mr. Smith is well-known in the rock products and construction field as the former Chicago manager for the Western Wheeled Scraper Co., Aurora, Ill., and its successor, The Austin-Western Road Machinery Co.

R. G. LeTourneau, Inc., Peoria, Ill., announces that E. R. Galvin has resigned his position as general sales manager of Caterpillar Tractor Co. to become associated with LeTourneau in a like capacity. He succeeds Denn M. Burgess, who now is general manager. Born in 1884 in Ontario, Canada, Mr. Galvin's parents moved to the United States when he was eight years old. His early public school education in Michigan and Wisconsin was followed by a business course in Duluth, Minn. In 1906, he entered the employ of Dupont; in 1925 he entered the tractor field as general sales manager of the Cleveland Tractor Co.; and in 1927 he joined the Caterpillar organization, traveling for them as a general representative. Shortly afterwards, he was advanced to Eastern sales manager, and a year and a half ago became Caterpillar's first general sales manager, directing their world-wide sales organization.

To the left, E. R. Galvin, talking to Denn M. Burgess

Caterpillar Tractor Co., Peoria, Ill., has appointed Donald A. Robinson, treasurer of the company, as general sales manager. W. J. McBrian, domestic credit manager, has been promoted to head of the treasury department. Mr. Robinson joined the company's western division at San Leandro, Calif., in 1926, and was assigned to manual labor in the parts store room. From there he worked his way up through various office departments to credit manager of the western division. Mr. Robinson came to Peoria in 1930, was promoted to assistant treasurer three years later and to treasurer in 1937.

Donald A. Robinson

Macwhyte Co., Kenosha, Wis., announced that its metallurgist, Walter R. Bloxdorf, has received from the Wire Association the supreme award for the outstanding contribution to the industry for 1938. A bronze plaque was presented to Mr. Bloxdorf by the board of directors of the National Metals Congress, of which the Wire Association is an affiliate, at their recent convention at Detroit, Michigan. Mr. Bloxdorf is a member of The American Society for Metals, The Electro-chemical Society, The American Society for Testing Materials, and The Wire Association.

Manhattan Rubber Mfg. Co., now the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., observed its 45th anniversary on October 28. Manhattan's growth has been gradual and conservative until it is now one of the world's largest manufacturers of mechanical rubber goods. Two months after the formation of the company, on January 1, 1894, manufacturing operations were started in one small building 50 by 150 ft. with a crew of 40 men. Frank Cazenove Jones, the first president, was responsible for the financing and planning of the company. He was forced to retire in 1903 because of ill health and was succeeded by Col. Arthur F. Townsend, who served as president for 26 years, up to the merger in 1929 which formed Raybestos-Manhattan, Inc. Since then he has been chairman of the board of Raybestos-Manhattan, Inc., and manager of the Manhattan division. Manhattan now employs 3000 persons in a plant that covers 800,000 sq. ft. of floor space. Auxiliary plants have been established at Whippany, N. J., Neenah, Wis., and North Charleston, S. C.

Col. Arthur F. Townsend

Hercules Powder Co., Wilmington, Del., has appointed Tom Brown as manager of the contractors' division of the explosives department.

Trade Literature

The following literature, recently published, is available free, upon request to the respective sponsor:

Automatic Controls.—General Electric Co., Schenectady, N. Y., has issued bulletin No. GEA-2963 describing Type TSA-14 time switch, an automatic repeating timer designed to control electric circuits regardless of the time of day, and bulletin No. GEA-2892 describing duplex switchboards which have the control and indicating equipment on one side; recording, regulating and protective equipment on the other.

Telemetering.—The Bristol Co., Waterbury, Conn., has published a 24-page bulletin which contains detailed engineering information about the Metameter system of telemetering as well as illustrations of the Metameter in operation.

Welding.—Westinghouse Electric and Mfg. Co., East Pittsburgh, Penn. "The Welder's Trouble Shooter," an 8-page booklet tabulates the common troubles met by welders together with the cause and cure for each.

Steel Buyers' Guide.—Joseph T. Ryerson & Sons., Inc., Chicago, a pocket-size catalog lists and describes the complete range of certified steels and allied products carried in stock. Included also are handy reference tables, weight and standard specification listings.

Automatic Weighing Machines.—Merrick Scale Mfg. Co., Passaic, N. J., has released bulletin No. 388, which describes and illustrates the use of the Merrick Feedoweight for feeding, proportioning or batching materials.

Mining Machinery.—Straub Mfg. Co., 507 Chestnut Street, Oakland, Calif. A 40-page Bulletin No. 302 describes and illustrates the complete line of Straub-built mining equipment.

Thew Shovel Co., Lorain, Ohio, reports the death of A. L. McLain, assistant to the sales manager. A native of Greenville, Tex., Mr. McLain was a member of the Thew Sales Department for the past 10 years. Eight were spent as Southwestern district sales manager at Dallas and the last two as assistant to the sales manager at Lorain, Ohio.

Roller Chains and Sprockets.—Chain Belt Co., Milwaukee, Wis., has issued a new 128-page catalog, No. 333, which describes its complete line of roller chains and sprockets. The catalog is replete with tabulations of its many sizes of sprockets and chains.

Tractor.—Caterpillar Tractor Co., Peoria, Ill., has published a new booklet which gives operating costs and specifications of the 25-hp. "Caterpillar" Diesel D2 tractor.

Conveyors.—Chain Belt Co., Milwaukee, Wis., has issued a new folder No. 332 that illustrates the use and design of Rex apron conveyors. It also includes detailed engineering information and data necessary for the use of these conveyors.

Esso Oilways, industrial lubrication magazine published by the various divisions of the Standard Oil Co., has in its July issue an illustrated article entitled "Milling Around Cement Mills" which informs the readers of the magazine about the manufacture of cement. The article also presents some problems that have confronted the manufacturers of cement and the manner in which they were solved.

Diesel Engines.—General Motors Sales Corporation, Diesel Engine Division, Cleveland, Ohio. "Why a Diesel" discusses this question as well as the selection of a Diesel engine. It also contains excellent illustrations and data on the various models of GM Diesels.

Gilmore Wire Rope Division of the Jones & Laughlin Steel Corporation, Muncy, Penn., has brought out an interesting brochure describing its plant. There is also a pictorial panorama of the manufacture of Gilmore precision rope

Pumps.—The Lawrence Machine & Pump Corp., 371 Market St., Lawrence, Mass., has issued bulletin 203-2 describing the application of its acid and chemical pumps.

Sand-Lime Brick Production and Shipment

Eight active sand-lime brick plants reporting for October and eight for September, statistics for which were published in November.

Average Price for October

	Plant Price	Delivered Price
Detroit, Mich.	.....	$16.00
Minneapolis, Minn.	$ 9.00	11.50
Mishawaka, Ind.	10.50	....
Pontiac, Mich.	12.50	14.00
Saginaw, Mich.	11.00	....
St. Louis Park, Minn.	8.50	10.00
Syracuse, N. Y.	14.00	16.00 C/L 20.00 L/C

Statistics for September and October

	September†	October‡
Production	1,329,125	2,507,640
Shipment (rail)	288,453	629,000
Shipment (truck)	1,565,517	1,220,605
Stock on hand	1,488,400	1,705,884
Unfilled orders	582,000	400,000

†Eight plants reporting: incomplete, one not reporting production, five not reporting unfilled orders and four not reporting stock on hand.

‡Nine plants reporting: one reporting shipments 323,950 with no distinction between truck and rail; incomplete, two not reporting stocks on hand and three not reporting unfilled orders.

Portland Cement Statistics

IN OCTOBER, 1938, the portland cement industry produced 11,556,000 bbl., shipped 12,357,000 bbl. from the mills, and had in stock at the end of the month 20,574,000 bbl., according to the Bureau of Mines. Production and shipments of portland cement in October, 1938, showed increases, respectively, of 1.6 and 10.4 percent, as compared with 1937. Portland cement stocks at mills were 4.6 percent lower than a year ago.

Total production for the ten months ended October 31, 1938, amount to 87,300,000 bbl., compared with 100,183,000 bbl., in the same period of 1937.

The mill value of the shipments, 79,313,000 bbl., in the first nine months of 1938, is estimated as $115,353,000. Reports of producers show that of the total shipments for nine months, approximately 2,485,000 bbl., with an estimated mill value of $4,591,000, comprised high-early-strength portland cement.

Statistics here given are compiled from reports for October received by the Bureau of Mines from all manufacturing plants.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	October 1937	October 1938	Sept. 1938	Aug. 1938	July 1938
The Month	52.0	52.9	49.9	50.4	50.2
Twelve Months Ended	46.7	40.2	40.2	40.4	40.8

Concrete Pavement Yardage

AWARDS of concrete pavement for October, 1938, have been announced by the Portland Cement Association as follows:

Type of construction	Sq. yds. awarded during Oct., 1938	Total sq. yds. during first nine months, 1938
Roads	2,871,080	32,134,809
Streets	1,673,877	13,501,160
Alleys	125,807	727,880
Total	4,607,764	46,363,849

Prices Bid—Contracts Let

ABINGDON, ILL.: Richter and Rork Co., Avon, Ill., was recently awarded a contract by the city council of Abingdon to spread 700 cu. yd. of gravel at $1.59 a cu. yd.

JEFFERSON, OHIO: Troyer Contracting Co., Kinsman, Ohio, was awarded a contract for graveling 2¼ miles of road 343-AB in Pierpont township by the county commissioners. The contract called for 5000 cu. yd. of bank run gravel at 55c per cu. yd.

OKLAHOMA CITY, OKLA.: The county commission recently awarded the Southern Rock Asphalt Co. a contract for a year's supply of asphalt at $5.25 a ton, and the Midwest Materials Co. received the contract for gravel at $1.37 a ton.

CHARDON, OHIO: McGurr and Best were awarded the contract for 1000 cu. yd. of gravel for the Burton-Claridon Road improvement on a bid of 95c per cu. yd.

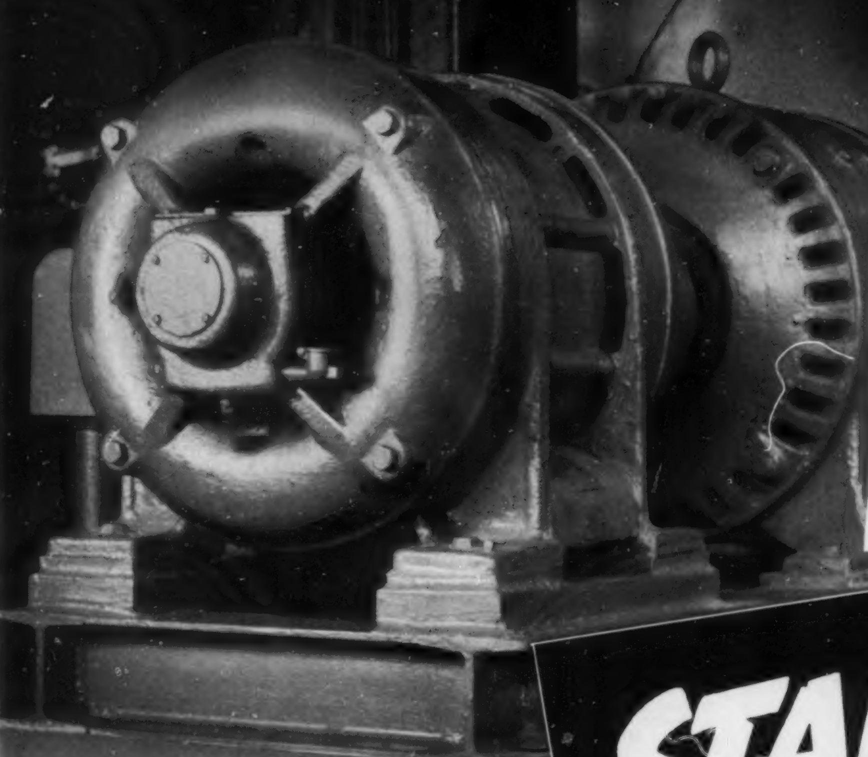
RARITAN, ILL.: R. A. Foll was given the contract to gravel 1½ miles of road in Media township at a price of $1.19 per cu. yd.

ALEDO, ILL.: Automatic Gravel Products Co., Davenport, Iowa, won the award for gravel to cover 3.62 miles of road connecting the north end of the road out of Joy, Ill., with the Rock Island county line with a bid of $1.94 a cu. yd.

YAKIMA, WASH.: Homer G. Johnson, Portland, Ore., submitted the low bid on 95,000 tons of sand and gravel to be used in the construction of the Roza canal. The material includes 36,000 tons of sand, 29,000 tons of fine gravel, and 30,000 tons of gravel, ¾- to 1½-in. size. The Johnson bid was $65,350.

REPLACES 2 OILS AND SAVES BEARINGS

ON SHOVEL MOTOR-GENERATOR SET...



• ORDINARILY, shovel operation in stripping required two oils, one for summer and one for winter lubrication of motors and motor generator bearings. A central state operator was having trouble during the spring and fall seasons, when temperatures varied widely, in determining just when to change oil. Each change of season brought a disheartening number of bearing failures.

The Standard Lubrication Engineer told him about Stanoil No. 25, an oil with low pour test that maintains its lubricating quality over a wide range of temperatures.

With Stanoil No. 25 in the bearings the year around, the chief electrician found that he could quit trying to outguess the weather man. Bearing failures stopped, and, in addition, he had one oil less to stock. The slightly higher cost of the oil was more than paid for by saving in bearings and repair costs.

It's almost certain that somewhere in your operation the higher quality in Stanoil will pay its way in reduced maintenance and lower ultimate oil costs. Let a Standard Lubrication Engineer point out some of these places. He'll make this analysis at no cost to you. Call him at the nearest Standard Oil (Indiana) office or write 910 South Michigan Avenue, Chicago, Illinois.

STANOIL

STANDARD OIL COMPANY (INDIANA)

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Chicago Bridge & Iron Co.
Raymond Pulverizer Division
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Smidth, F. L., & Co.

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American Air Filter Co.
Blaw-Knox Co.
Fuller Company
W. W. Sly Mfg. Co.

Dust Recovery Plants
Sly, W. W., Mfg. Co.

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Atlas Powder Co.

Electric Motors
Allis-Chalmers Mfg. Co.

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Allis-Chalmers Mfg. Co.

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Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
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Smidth, F. L., & Co.
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Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Universal Crusher Co.
Williams Patent Crusher & Pulv. Co.

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Sturtevant Mill Co.
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Allis-Chalmers Mfg. Co.
National Supply Co.
New Holland Machine Co.
Nordberg Mfg. Co.
Superior Diesel

Engines (Natural Gas)
Allis-Chalmers Mfg. Co.

Engines (Steam)
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Exhauster
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Raymond Pulverizer Division

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Atlas Powder Co.

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Blaw-Knox Co.
Sly, W. W., Mfg. Co.
Smidth, F. L., & Co.

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Feeders
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Earle C Bacon, Inc.
Barber-Greene Co.
Besser Mfg. Co.
Blaw-Knox Co.
Fuller Co.
Hetherington & Berner, Inc.
Link-Belt Co.
Pennsylvania Crusher Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smidth, F. L., & Co.
Smith Engr. Wks.
Stearns Mfg. Co.
Traylor Engineering & Mfg. Co.
Universal Crusher Co.

Filter Cloth
Roebling's, John A., Sons Co.,
Tyler, W. S., Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Forgings
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.

Fuels (Diesel)
Texas Co.

Fuses (Detonating and Safety)
Atlas Powder Co.
Ensign-Bickford Co.

Fuse Cutters
Ensign-Bickford Co.

Fuse Lighters
Ensign-Bickford Co.

Gasoline
Gulf Refining Co.
Standard Oil Co.
Texas Company

Gears
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Frog, Switch & Mfg. Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Generators & Motor Generator Sets
Allis-Chalmers Mfg. Co.
National Supply Co.
Nordberg Mfg. Co.
Superior Diesel

Glass Sand Equipment
Lewistown Fdry. & Mach. Co.

Grapples
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Co.

Grease
Bacon, Earle C., Co.
Gulf Refining Co.
Standard Oil Co.
Texas Company

Grease Cups
Link-Belt Co.
Robins Conveying Belt Co.

Guards (Lamp)
Flexible Steel Lacing Co.

Guards (Machinery)
Harrington & King Perforating Co.
Tyler, W. S., Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Morris Machine Works

Gypsum Plants
Traylor Engr. & Mfg. Co.

Hoists (Chain, Electric, Portable, Skip, Etc.)
Allis-Chalmers Mfg. Co.
Besser Mfg. Co.
Commercial Shearing & Stamping Co.
Eagle Iron Works
Hetherington & Berner, Inc.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co.
Northwest Engineering Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Sauerman Bros., Inc.
Smith Engr. Wks.
Stearns Mfg. Co.
Traylor Engineering & Mfg. Co.

Hoppers
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Hose (Water, Steam, Air Drill, Pneumatic, Sand Suction and Discharge)
Dixie Machinery Mfg. Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Morris Machine Works

Hydrators (Lime)
Chicago Bridge & Iron Co.
Traylor Engr. & Mfg. Co.

Jigs (Sand and Gravel)
Allis-Chalmers Mfg. Co.
Traylor Engineering & Mfg. Co.

Kerosene
Standard Oil Co.

Kilns Parts
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Kilns (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Kilns (Vertical)
Blaw-Knox Co.
Chicago Bridge & Iron Co.

Kiln Burners
Babcock & Wilcox Co.
Smidth, F. L., & Co.

Kiln Chain Systems
Smidth, F. L., & Co.

Kiln Liners (Metal)
Traylor Engr. & Mfg. Co.

Kominuters
Smidth, F. L., & Co.

Laboratory Apparatus
Smidth, F. L., & Co.

Lift Trucks
Besser Mfg. Co.
Stearns Mfg. Co.

Lime Handling Equipment
Chicago Bridge & Iron Co.
Fuller Co.
Link-Belt Co.
Raymond Pulv. Div.
Robins Conveying Belt Co.

Lime Plants
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Blaw-Knox Co.
Chicago Br[illegible]ge & Iron Co.
Smidth, [illegible] & Co.
Traylo[illegible]ineering & Mfg. Co.

Lime Putty Plants
Chicago Bridge & Iron Co.

Loaders (Bin, Car, Hopper, Truck, Etc.)
Barber-Greene Co.
Besser Mfg. Co.

Classified Directory (Cont.)

Bucyrus-Erie Co.
Fuller Company
Geo. Haiss Mfg. Co., Inc.
Link-Belt Co.
New Holland Machine Co.
Northwest Engineering Co.
Robins Conveying Belt
Ross Screen & Feeder Co.
Stearns Mfg. Co.

Loaders (Boat)
Link-Belt Co.

Loaders (Box Car)
Barber-Greene Co.
Link-Belt Co.

Loaders (Underground)
Allis-Chalmers Mfg. Co.
Nordberg Mfg. Co.

Locomotives (Diesel & Diesel-Electric
Davenport-Besler Corp.
Fate-Root-Heath Co.
Plymouth Locomotive Wks.

Locomotives (Electric, Trolley & Storage Battery)
Davenport-Besler Corp.

Locomotives (Gasoline & Gas-Electric)
Davenport-Besler Corp.
Fate-Root-Heath Co.
Plymouth Locomotive Wks.

Locomotives (Oil & Oil-Electric)
Fate-Root-Heath Co.
Plymouth Locomotive Wks.

Locomotives (Steam)
Davenport-Besler Corp.

Locomotive Stack Netting
Tyler, W. S., Co.

Lubricants
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
Standard Oil Co.
Texas Co.

Magnetic Separators
The Electric Controller & Mfg. Co.

Manganese Steel Parts
Bacon, Earle C., Inc.
Frog, Switch & Mfg. Co.

Material Handling Equipment
Allen-Sherman-Hoff Co.
Austin-Western Road Machy Co.
Barber-Greene Co.
Fuller Company
Link-Belt Co.
Raymond Pulverizer Division
Robins Conveying Belt Co.

Measuring Devices
Blaw-Knox Co.
Jaeger Machine Co.

Mill Parts
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Mills, Grinding (Ball, Tube, Hammer, Rod, Roll, Etc.) (See also Pulverizers)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Babcock & Wilcox Co.
Brooks Equipment & Mfg. Co
Dixie Machinery Mfg. Co.
Lewistown Foundry & Mach Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co
Strong-Scott Mfg. Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg Co.
Universal Crusher Co.
Williams Patent Crusher & Pulv. Co.

Mill Liners
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)

Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Mortar Colors
Mepham, Geo. S., Corp.

Mortar Mixers
Eagle Iron Works
Jaeger Machine Co.

Nozzles (Gravel Washing)
Link-Belt Co.

Nuts
Standard Pressed Steel Co.

Oils (Lubricating)
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
Standard Oil Co.
The Texas Co.

Oils (Cutting)
The Texas Co.

Ornamental Forms (Concrete)
Besser Mfg. Co.

Pallets
Anchor Concrete Machinery Co.
Bacon, Earle C., Inc.
Besser Mfg. Co.
Commercial Shearing and Stamping Co.
Multiplex Concrete Machy Co.
Stearns Mfg. Co.

Pans, Grinding (Wet & Dry)
Eagle Iron Works
Traylor Engineering & Mfg. Co.

Perforated Metal
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Chicago Perforating Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Joseph T. Ryerson & Son, Inc.
Traylor Engr. & Mfg. Co.

Perforated Screen Plates & Cloth—See Screen Cloth & Plates

Pinions
Bacon, Earle C., Inc.
Frog, Switch & Mfg. Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.

Pipe Molds and Machines (Concrete)
Besser Mfg. Co.
Stearns Mfg. Co.

Pipe
Chicago Bridge & Iron Co.
Frog, Switch & Mfg. Co.
Hetherington & Berner, Inc.
Morris Machine Works

Pipe Fittings
Hetherington & Berner, Inc.

Pipe Forms & Machines (Concrete)
Universal Concrete Pipe Co.

Plaster Colors
Mepham, Geo. S., Corp.

Pontoons
Chicago Bridge & Iron Co.
Eagle Iron Works
Morris Machine Works

Powder (Blasting)
Atlas Powder Co.

Power Transmission Machinery
Allis-Chalmers Mfg. Co.
Link-Belt Co.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Classified Directory (Cont.)

Pulleys
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.
Robins Conveying Belt Co.

Pulverizer Parts
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Dixie Machinery Mfg. Co.
Smidth, F. L., & Co.

Pulverizers (Hammer, Ring, Rod & Roll) (See Also Mills & Crushers)
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Babcock & Wilcox Co.
Blaw-Knox Co.
Brooks Equipment & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Combustion Engr. Corp.
Dixie Machy. Mfg. Co.
New Holland Machine Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Strong-Scott Mfg. Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Universal Crusher Co.
Williams Patent Crusher & Pulv. Co.

Pumps (Diaphragm)
Jaeger Machine Co.

Pumps (Dredge)
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
Hetherington & Berner, Inc.
Morris Machine Wks.

Pumps (Dry Pulverized Material)
Babcock & Wilcox Co.
Fuller Company
Morris Machine Works
Smidth, F. L., & Co.

Pumps (Slurry)
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Morris Machine Wks.
Smidth, F. L., & Co.
Wilfley, A. R., & Sons, Inc.

Pumps Valves (Slurry)
Fuller Co.
Wilfley, A. R., & Son, Inc.

Pumps (Vacuum)
Allis-Chalmers Mfg. Co.
Fuller Company
Smidth, F. L., & Co.

Pump Valves (Dry Pulverized Material)
Fuller Co.

Pumps (Water)
Allis-Chalmers Mfg. Co.
Jaeger Machine Co.
Morris Machine Wks.

Rectifiers
Allis-Chalmers Mfg. Co.

Recuperators
Traylor Engineering & Mfg. Co.

Refractories
Smidth, F. L., & Co.

Regulators (Voltage)
Allis-Chalmers Mfg. Co.

Rewashers (Screw)
Link-Belt Co.
Smith Engineering Works

Roofing
Gilmore Wire Rope Div.
Jones & Laughlin Steel Corp.
Ryerson, Jos. T., & Son, Inc.
Texas Co.

Rope (Transmission)
Allis-Chalmers Mfg. Co.

Sand Drags
Eagle Iron Wks.
Link-Belt Co.
Smith Engr. Wks.

Sand and Gravel Plants
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Eagle Iron Works
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Sand Separators
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Simplicity Engineering Co.
Smith Engineering Wks.

Sand Settling Tanks
Chicago Bridge & Iron Co.
Eagle Iron Wks.
Hendrick Mfg. Co.
Link-Belt Co.
Nordberg Mfg. Co.
Pioneer Engineering Wks., Inc.
Smith Engr. Wks.

Scrapers (Power Drag)
Austin-Western Road Machy. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Link-Belt Co.
Northwest Engineering Co.
Pioneer Engineering Wks., Inc.
Sauerman Bros., Inc.

Screen Cloth & Plates (Perforated)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Chicago Perforating Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Ryerson, Jos. T., & Sons, Inc.
Traylor Engineering & Mfg. Co.

Screen Parts
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Hendrick Mfg. Co.
Pioneer Engineering Wks., Inc.
Traylor Engineering & Mfg. Co.

Screens (Grizzly)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Eagle Iron Works
Hendrick Mfg. Co.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
Productive Equipment Corp.
Robins Conveying Belt Co.
Roebling's, John A., Sons Co.,
Ross Screen & Feeder Co.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Tyler, W. S., Co.
Universal Vibrating Screen Co.

Screens (Laboratory)
Allis-Chalmers Mfg. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Roebling's, John A., Sons Co.,
Smidth, F. L., & Co.
Tyler, W. S., Co.
Williams Patent Crusher & Pulv. Co.

Screens (Revolving)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Eagle Iron Wks.
Haiss, Geo., Mfg. Co., Inc.
Link-Belt Co.
Pioneer Engineering Wks., Inc.

Classified Directory (Cont.)

Roebling's, John A., Sons Co.,
Robins Conveying Belt Co.
Smith Engr. Wks.
Traylor Engr. & Mfgl Co.
Tyler, W. S., Co.

Screens, Scalping
Allis-Chalmers Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Screens (Trommel)
Traylor Engr. & Mfg. Co.

Screens (Vibrating)
Allis-Chalmers Mfg. Co
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Eagle Iron Works
Lewistown Fdry. & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co
Pioneer Engineering Wks. Inc.
Robins Conveying Belt Co.
Simplicity Engineering Co.
Smith Engineering Works
Sturtevant Mill Co
W. S. Tyler Co.
Universal Crusher Co.
Universal Vib. Screen Co.
Williams Patent Crusher & Pulv. Co.

Screws (Cap, Self Locking, Set, Hollow Set)
Standard Pressed Steel Co.

Seal Rings
Traylor Engineering & Mfg. Co.

Septic Tank Molds (Concrete)
Suburban Sanitation Systems Co.

Shafting
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Link-Belt Co.

Shale Planers
Eagle Iron Wks.

Sheaves
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Haiss, Geo., Mfg. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Roebling's, John A., Sons Co.,
Sauerman Bros.

Shovels (Compressed Air)
Nordberg Mfg. Co.

Shovels, Power (Diesel, Diesel-Air, Electric, Gasoline, Gas-Electric, Oil & Steam)
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Northwest Engineering Co.
Link-Belt Co.

Shovels (Tractor)
Austin-Western Road Machy. Co.
Link-Belt Co.

Shovels (Underground)
Allis-Chalmers Mfg. Co.
Nordberg Mfg. Co.

Shredders
Williams Patent Crusher & Pulv. Co.

Sieves (Testing)
Hendrick Mfg. Co.
Roebling's, John A., Sons Co.,
Smidth, F. L., & Co.
Tyler, W. S., Co.

Silos
Blaw-Knox Co.
Chicago Bridge & Iron Co.
F. L. Smidth & Co.

Silo Stave Machines (Concrete)
Besser Mfg. Co.

Skids
Besser Mfg. Co.

Slakers (Rotary)
Traylor Engineering & Mfg. Co.

Slugs (Grinding)
Smidth, F. L., & Co.

Slurry Mixers
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Slurry Separators
Smidth, F. L. & Co.

Slurry Thickeners
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Smokestacks
Chicago Bridge & Iron Co.
Hendrick Mfg. Co.
Traylor Engineering & Mfg. Co.

Speed Reducers
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Spouts
Link-Belt Co.
Traylor Engineering & Mfg. Co.

Sprockets
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.

Standpipes
Chicago Bridge & Iron Co.
Ross Screen & Feeder Co.

Steel, Abrasion Resisting
Gilmore Wire Rope Div.
Jones & Laughlin Steel Corp.
Joseph T. Ryerson & Son, Inc

Steel (Electric Furnace)
Timken Roller Bearing Co.

Steel (Open Hearth)
Timken Roller Bearing Co.

Steel (Special Alloy)
Timken Roller Bearing Co

Stokers
Babcock & Wilcox Co.
Combustion Engineering Corp
Link-Belt Co.

Storage Equipment
Barber-Greene Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co
Sauerman Bros., Inc.

Stucco Colors
Mepham, Geo. S., Corp.

Switchboards
Allis-Chalmers Mfg. Co.

Tampers (Power & Hand)
Besser Mfg. Co.
Multiplex Concrete Machy Co.
Stearns Mfg. Co.

Tanks
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Combustion Engineering Corp
Eagle Iron Works
Hendrick Mfg. Co.
Link-Belt Co.
Pioneer Engineering Wks., Inc.
Raymond Pulverizer Division
Traylor Engineering & Mfg. Co.

Classified Directory (Cont.)

Towers
Blaw-Knox Co.
Eagle Iron Works
Hendrick Mfg. Co.
Jaeger Machine Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Track & Track Equipment
Besser Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsi.)
Nordberg Mfg. Co.

Track Shifters
Nordberg Mfg. Co.

Track Systems (Overhead)
Link-Belt Co.

Tractors
Allis-Chalmers Mfg. Co.

Tractors (Electric)
Link-Belt Co.

Trailers (Industrial & Quarry)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.

Transformers
Allis-Chalmers Mfg. Co.

Trucks (Agitator)
Blaw-Knox Co.

Trucks (Dump)
Ford Motor Co.

Truck Bodies (Dump)
Commercial Shearing & Stamping Co.
Dempster Bros.
Ford Motor Co.

Trucks (Hand)
Standard Pressed Steel Co.

Trucks (Industrial)
Standard Pressed Steel Co.

Trucks (Mixers)
Blaw-Knox Co.
Jaeger Machine Co.
Smidth, F. L., & Co.
Smith, T. L., Co., The

Tubing (Seamless Steel)
Timken Roller Bearing Co.

Turbines
Allis-Chalmers Mfg. Co.

Unloaders
Barber-Greene Co.
Bucyrus-Erie Co.
Fuller Company
Haiss, Geo., Mfg. Co.
Link-Belt Co.
New Holland Machine Co.
Northwest Engineering Co.
Robins Conveying Belt Co.

Unloaders (Boat)
Link-Belt Co.

Unloaders (Box Car)
Barber-Greene Co.
Besser Mfg. Co.
Fuller Co.
Link-Belt Co.
Stearns Mfg. Co.

Unloaders (Pneumatic)
Fuller Company

Unloaders (Underground)
Nordberg Mfg. Co.

Ventilating Apparatus
Blaw-Knox Co.

Vibrators
Link-Belt Co.
Stearns Mfg. Co.
W. S. Tyler Co.

Wagons (Dump)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Blaw-Knox Co.

Washers (Log)
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Smith Engineering Works
Traylor Engr. & Mfg. Co.

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Chicago Bridge & Iron Co.
Eagle Iron Works
Haiss, Geo., Mfg. Co.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Roebling's, John A., Sons Co.,
Smidth, F. L., & Co.
Smith Engineering Wks.
Traylor Engr. & Mfg. Co.
Tyler, W. S., Co.
Universal Crusher Co.
Universal Vibrating Screen Co.

Weighing Equipment
Blaw-Knox Co.
Fuller Company
Jaeger Machine Co.

Welding Electrodes
American Steel & Wire Co. (U. S. Steel Corp. Subsi.)

Welding & Cutting Equipment
Roebling's, John A., Sons Co.,

Welding Rods
Roebling's, John A., Sons Co.
Ryerson, Jos. T., & Son, Inc.

Welding Wire
Roebling's, John A., Sons Co.,

Winches
Link-Belt Co.
Robins Conveying Belt Co.

Wire Cloth
Bacon, Earle C., Co.
Cleveland Wire Cloth & Mfg. Co.
Eagle Iron Works
Leschen, A., & Sons Rope Co.
Link-Belt Co.
Ludlow-Saylor Wire Co.
Pioneer Engineering Wks., Inc.
Robins Conveying Belt Co.
Roebling's, John A., Sons Co.,
Tyler, W. S., Co.
Universal Vibrating Screen Co.

Wire (Copper, Iron & Steel)
Roebling's, John A., Sons Co.,

Wire (Electric)
Roebling's, John A., Sons Co.,

Wire Rope
American Cable Co., Inc.
Gilmore Wire Rope Div.
Hazard Wire Rope Co.
Jones & Laughlin Steel Corp.
A. Leschen & Sons Rope Co
Roebling's, John A., Sons Co.,

Wire Rope Clips
American Cable Co.
Gilmore Wire Rope Div.
Hazard Wire Rope Co.
Jones & Laughlin Steel Corp.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.,

Wire Rope Fittings
American Cable Co.
Hazard Wire Rope Co.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.,

Wire Rope Hooks
American Cable Co.
Hazard Wire Rope Co.
Leschen, A., & Sons Rope Co.

Wire Rope Lubricants
Roebling's, John A., Sons Co.,
Texas Co.

Wire Rope Slings
American Cable Co.
Hazard Wire Rope Co.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.,

Wire Rope Sockets
American Cable Co.
Hazard Wire Rope Co.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.,

Classified Advertisements

POSITIONS WANTED — POSITIONS VACANT Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION—Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, 30 inches to the page.

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Used Equipment for Sale

CONSOLIDATED GOOD USED EQUIPMENT

SELECTED SPECIALS

2—250 H.P. Ingersoll Rand Diesel Engine Generator Sets, 3/60/440 V.
2—550 CFM I-R Diesel driven POC—2 Air Compressors, also 370 CFM Diesel portable.
1—¾ yd. Marion No. 21 All-Electric Shovel.
1—90 H.P. Lidgerwood double drum Gasoline Hoist.

JAW CRUSHERS:
10x15, 13x30, 15x30, 24x36 Farrel; 18x30, 24x36 Allis Chalmers; 30x60, 36x42 Traylor.

CRUSHING ROLLS:
1—42"x16" "B" Allis Chalmers, used one month; 24x14", 36x16" A-C; 20x14" Sturtevant; 30x10" Traylor; 24x24", 18x16" single roll crushers.

ROTARY KILNS and DRYERS:
20—Rotary Dryers; 3'6x20 with oil furnace, 4x30, 5x30, 6x40, 6x50, 6x60, 8x60, 9x85'. Rotary Kilns; 3'6x20, 4x30, 6x40, 6x60, 7x100, 8x125, 9'6x150'.

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GYRATORY: 42" McCully with 80% brand new parts. 12-N Allis-C. 36" Superior McCully like new. 20" Superior McCully reduced to 16". Telsmith Nos. 4, 5, 6 & 9. Gates Nos. 10, 9, 8, 7½, 6, 5 4 & 3. Also Austins, Kennedys and Traylors.
JAW TYPE: Traylor 84x66, 60x48, 30x60 & 24x72. Buchanan 52x72 & 30x42. Farrel 24x36 & 30x36. P&M 24x36. Good Roads 1030 & 1040. Bakstad 3-jaw 8x20. Misc. 9x16, 8x36, 15x36, Etc.
REDUC. TYPE: 6, 10 & 18" Super. McCulley. 2', 3' & 4' Symons Cone. 7" & 10" Newhouse. Etc.
ROLLS: Allis-C. 36x16, 40x15 & 54x24. Jeff. 30x30.
HAMMERMILLS: Williams Nos. 3, 4, 5 & 9. Others.
MILLS: Kennedy Ball 4x6, 5x6 & 5x8. Ke[illegible] 34x7". 48" Fuller-Lehigh. 5'x22' Bonnot and others.

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POSITION WANTED—YOUNG MAN WITH 10 years experience as Superintendent and five years as assistant superintendent of lime plants and stone quarries, wishes to secure a position with some company in any capacity. Can give best of reference. Box 858 Care of Rock Products, 205 West Wacker Drive, Chicago, Ill.

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